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ABSTRACT

This study documents the effects of participation in the Teacher Enhancement Program (TEP) of the National Science Foundation (NSF). The NSF awarded more than 600 grants to scientists, mathematicians, and educators to develop and operate inservice teacher training programs between 1984 and 1989. The present study focuses specifically upon the assessments of those teachers who participated in TEP projects in terms of: the characteristics and quality of the projects; the substantive and pedagogic skills they acquired; and the benefits to their students and schools. In addition, the study integrates the findings from the participants' survey with those of an earlier survey of principal investigators who directed the projects. After an introduction that provides information on the context, objectives, and methodology of the study, the findings are presented in six parts. Part One discusses the characteristics of the TEP and the principal investigators (number of projects, financial support, PI professional and personal characteristics, and prior PI experience with TEP awards). Part Two discusses the recruitment of participants and their characteristics, with attention given to procedures for recruitment and selection, recruitment of special groups, number of participants per award, experience, and science and mathematics education). Part Three addresses the topic of goals and objectives for participation from perspectives of both PIs and participants, and general project operation. Part Four presents assessments of TEP projects under the headings: Project Outcomes and Impacts and Career and Educational Development among Participants. Part Five discusses relationships among the variables from perspectives of participants and PIs . Part Six presents PI and participant observations on their projects and on the TEP program, and implications of the studies for the NSF. The final section presents conclusions and recommendations. Among the conclusions are six areas of goal accomplishments: the projects reached teachers; participants were pleased with the operation of their TEP projects; participants reported a variety of improvement in their approaches to teaching; participants reported significant changes in student behaviors; a variety of participant leadership activities were reported to have increased; and 81 percent of participants would recommend the program to others. Four appendices (which represent about one third of the volume) include: annotated participant survey questionnaire; annotated principal investigator questionnaire; tables; and bibliography. (LL)

ED 372 027

DIVISION OF RESEARCH, EVALUATION AND DISSEMINATION • REPORT

A Study of

NSF TEACHER ENHANCEMENT PROGRAM (TEP) PARTICIPANTS AND PRINCIPAL INVESTIGATORS:

1984-1989

Volume II: Technical Report

Abt Associates Inc.
Center for Science and Technology Policy Studies
Cambridge, Massachusetts

National Science Foundation
Education and Human Resources Directorate

SP035226

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PARTICIPANTS IN THE NSF TEACHER ENHANCEMENT PROGRAM: 1984-1989

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PREFACE

The National Science Foundation supported more than 600 inservice teacher training projects between 1984 and 1989 under its Teacher Enhancement Program (TEP)[1]. This is but one component of a comprehensive NSF effort to assure that the nation's future supply of qualified scientists, mathematicians, and engineers is adequate for the challenges ahead and that American citizens are able to function effectively in a technologically intensive world.

In 1990, the Division for Research, Evaluation and Dissemination (RED)[2] undertook the first of two studies of TEP, in which a survey was conducted of the 600 Principal Investigators (PIs) who had operated inservice teacher enhancement projects. This survey sought to learn about their goals for their TEP projects, who they sought to reach, how participants were recruited and from what types of schools, how PIs ran their projects, who helped them, and how PIs assessed the impact of their projects upon the participants. Subsequently, a second survey was conducted in 1992 of individuals who had participated in these projects in order to learn, first hand, from the participants, about their experiences with the TEP projects and what they believed were the major impacts. The findings from both of these studies have been merged in the present report.

Several lessons have been learned in the course of conducting these studies and are worth noting at the outset. First, these two studies of TEP projects provide an unusual program evaluation opportunity in that this report builds upon data and observations provided both by the TEP project PIs and by participants in the TEP projects. The second study of participants obtained information complementary to the earlier survey of PIs. The perspectives of participants on many of the same questions asked of PIs provide a form of validation regarding earlier PIs' assessments of project impacts. If both PIs and participants independently confirm that something was accomplished by a project, we may have greater confidence in the ability of

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[1] *In this report, the acronym TEP is used to designate the Teacher Enhancement Program. Within the National Science Foundation, the Division for Teacher Enhancement and Preparation was also designated TEP; at that time, the Teacher Enhancement Program used the acronym TE.*

[2] *At that time, the name for this division was the Office of Studies, Evaluation and Dissemination (OSED).*

PIs to assess the impacts of their projects on their participants. In fact, many such instances of correspondence were found between responses provided by these two study groups (and are reported upon throughout this volume).

Second, in this report it is recognized that participants, most of whom are practicing teachers, do not necessarily constitute a homogeneous population. Teachers in elementary schools are unlikely to have the same needs with respect to inservice learning as their counterparts from secondary schools. In order to deal with this consideration, various relationships among the findings are examined and differences among participants as a function of grade level are noted.

Third, since the awards examined cover a six year time frame, the projects themselves may have changed over time. Thus, data were analyzed by cohort year and where changes occurred over time, they are commented upon.

This volume is designed for use by two audiences. First, for *NSF program officers*, Volume II provides extensive details on the study design, findings on many separate topics, the relationships among various findings, and conclusions and recommendations. In addition, special exhibits are included that provide quotations from both PIs and participants on a variety of questions concerning the impacts of the TEP projects, lessons learned, "best" models for in-service programs, and so forth.

Second, for the *technically oriented reader*, Volume II provides details on such matters as sampling and weighting procedures, and complete statistical tables and copies of the questionnaire are provided..

The companion Volume I provides the reader a *summary* of many of the key findings from this evaluation. It was designed to be reviewed quickly in order to find out what was learned from the two studies. However, much of the richer detail had to be omitted.

Recommendations derived from the surveys have been made with two objectives in mind. First, to suggest any improvements in the operation of the program itself that will, over the long run, further enhance its effectiveness. Second, to ensure that subsequent evaluation efforts will contribute the most policy- and program-relevant information to the staff of NSF. It is important to note that the recommendations presented in this report are based upon the responses to various questions posed to PIs and participants involved with TEP projects during the period between 1984 and 1989. In turn, these awards were operating under program guidelines issued for applications made during those fiscal years. Thus, these recommendations do *not* take into account changes in the TEP policies, program, and guidelines made in subsequent years. In the interim period, a number of changes, in fact, have been made. According to NSF officials, "since the time of this study, the program has nearly doubled in length of training and the teacher stipend; allows for 5-year projects; requires more evaluation and follow-up; requires administrative support in home institutions; and focuses more on leader teachers and district-wide system projects." In this sense, a number of recommendations in this report provide a form of external support to changes already made.

Databases are available in electronic form to permit additional analyses of specific questions that educators and scientists may have.

Readers wishing to obtain more details on this study are invited to contact the Division of Research, Evaluation and Dissemination, Directorate for Human Resources, National Science Foundation, in Washington, D.C.

1.0 INTRODUCTION

The major objective of the present study is to document the effects of participation in the Teacher Enhancement Program (TEP)[1] of the National Science Foundation (NSF) upon science and mathematics teachers. Between 1984 and 1989, NSF awarded more then 600 grants to scientists, mathematicians and educators for the purpose of developing and operating in-service teaching projects. While the specific objectives of these projects were diverse, and the populations of teachers for whom the projects were intended also varied, the TEP projects shared in common a concern with enhancing the quality of education in science and mathematics provided to America's students, including all grades in elementary, middle, and senior high school.

The present study focuses specifically upon the assessments of those teachers who participated in many of the TEP projects in terms of:

- the characteristics and quality of the projects in which they participated;
- the substantive and pedagogic skills they acquired; and,
- the benefits, in turn, to their students and schools.

In addition, this study integrates the findings from the present survey of TEP participants with those of an earlier survey conducted of the TEP Principal Investigators who directed the projects.

Before discussing the objectives and methodology of the study in greater detail, it is useful to describe the context in which this study was conducted, including the nature of problems presently extant in American pre-college science and mathematics education, larger objectives of NSF in its support of education and training improvements in the United States, and the role played by the Directorate and Division of NSF responsible specifically for operation of TEP program.

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[1] *In this report, the acronym TEP is used to designate the Teacher Enhancement Program. Within the National Science Foundation, the acronym TE is used.*

1.1 Context to the Present Study

1.1.1 The National Context of Science and Mathematics Education

During the past decade, Americans became increasingly aware of, and concerned about, the quality of education provided to the nation's children and young people and the development of their educational skills. Based upon studies conducted by various commissions and public interest groups, America's popular press disseminated considerable information on the nature of the problems. President Bush emphasized his role as the educational president, and a National Governors Task Force on Education worked to develop ways to improve our nation's schools.

A major area of concern was with the quality of our science and mathematics curricula. Several factors appeared to account for citizen concerns:

- International tests of student performance in science and mathematics, geography, and related subject areas indicated that America's students performed poorly compared with students of other Western industrialized countries and Japan;

- Americans felt that the United States was losing its competitive advantage in the world economy, and a portion of this loss related to technology intensive industries. Notably, many technologies invented in the United States had subsequently lost market share to foreign firms.

- America's political leadership believed that the future development of the nation would be critically dependent upon the preparation of an adequate work force to serve in our nation's universities, technology-intensive industries, government and defense.

Related to these concerns, the average citizen needed to have a better understanding of science and mathematics in order to make intelligent decisions regarding health, environment, work, and the economy.

There are a number of demographic trends that also were important to policy makers concerned with improving the situation with respect to education in science, mathematics and engineering. As a result of a decline in the birth rates among American families during preceding decades, the size of the collage age cohort (i.e., 18-22 year olds) had been declining for almost a decade. There were fewer Americans available from which the college pool was drawn. At the same time, the participation rates of students electing to pursue science and engineering graduate training at American institutions of higher education was also declining.

A number of important groups also were under-represented in their selection of science and mathematics majors at our colleges and universities. These included women (who made up half of the college population), minorities (who constituted an increasing share of the total population), and persons with physical disabilities. Declining numbers of white college males pursuing graduate studies in science and engineering could have been offset by increases in these other groups, but this unfortunately did not happen. The problem was further compounded by the fact that even where minorities and females elected to go into sciences, most chose either life or social sciences; the physical sciences and mathematics were seldom the choice among students of these under-represented groups.

Thus, the nation faced a triple problem: at a time when the population from which future scientists and engineers would be drawn was decreasing, a smaller percentage of Americans is entered sciences, and our fastest growing segment of the population (minorities) was under-represented. Some of this decline in numbers and in participation rates was offset by citizens of foreign countries. For example, in many S&E fields, up to half of those earning doctorates were from foreign countries. While many of these foreign nationals chose to remain in the United States, many others returned home. Thus, enrollment by foreign nationals did not appear to be a viable, long term solution to declines in S&E enrollment by American citizens.

Many persons concerned with national science policy believed that solutions to problems in the quality of American student academic performance, and the development of a future S&E work force, must begin with the improvement of education at the precollege levels. It was within this broader societal context that NSF launched a broad range of initiatives designed to improve the overall quality of the nation's scientific and engineering education; the Teacher Enhancement Program (TEP) was one such initiative.

1.1.2 The Teacher Enhancement Program (TEP)

Since 1984, the Directorate for Education and Human Resources (EHR)[1] of the National Science Foundation (NSF) has supported TEP as one part of NSF's comprehensive effort to upgrade the quality of science and mathematics education in our nation's elementary, middle, and senior high schools. The overall goal of TEP is to improve the quality of instruction in science and mathematics by supporting projects designed to enhance teacher effectiveness while serving as prototypes for other in-service projects.

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[1] *Formerly, the Directorate for Science and Engineering Education (SEE).*

Under TEP, there are two principal intended beneficiaries.

- First, the participants themselves, who are typically **teachers of science and mathematics courses** in elementary, middle or senior high schools. Participation in a TEP project is intended to enhance their science or mathematics teaching capabilities.
- Second, the **present and future students** of TEP participants, consisting of a.) potential candidates for future **science, mathematics and engineering careers**, b.) students who will enter **technically oriented careers** in management and the professions, and c.) all other students who, though not directly involved with science, nevertheless must function as **citizens in a technology-intensive society** and thus should have a reasonable understanding of such matters in the course of everyday life.

The individual TEP projects are expected to serve as testing grounds for new training methods and new materials for effective teaching of science and mathematics, to foster cooperation among organizations concerned with improving local, state, regional and national science and technology education, and to provide opportunities for professional development of all teachers who participate.

By the end of the 1980s, many thousands of American elementary, middle, and high school science and mathematics teachers had participated in more than 600 TEP projects throughout the nation. More detailed information is provided on this program in Section 1.3.

1.1.3 The Present Study

The Division of Research, Evaluation, and Dissemination (RED), EHR, conducted the present study in order to document the nature and extent of direct impacts of the TEP program on those teachers who have participated in individual projects between 1984 and 1990, as well as the indirect impacts upon the schools, communities, and other scientific organizations. The information obtained from this study will serve two purposes:

- To report to the Congress and the American public in order to make them more aware of the presence and benefits of this program, and to answer any questions about what TEP has accomplished over the past years.

- To assess the policies and programs currently in place for TEP with an eye to making whatever improvements are necessary to ensure even more effective operations of the projects and impacts upon their various constituents.

The overall design of this evaluation, the contents of the survey questionnaire, the survey methodology, and the analyses that were performed under this study were shaped by two principal considerations; first, the overall educational policies, programs, and operations of the Foundation and its responsible directorate and division, and second, the implementation of the Teacher Enhancement Program itself. Therefore, we examine these two considerations before discussing implementation of the study.

1.2 Education as a Mission at NSF[1]

The congressional mandates and overall policies of NSF provide the foundation upon which all educational efforts of the agency are carried out. In turn, the Directorate for Education and Human Resources is the chief operating unit responsible for formulating and guiding these programs. Finally, the Division of Teacher Preparation and Enhancement has direct responsibility for administration of TEP, including the selection, funding, and supervision of the individual TEP projects. Together, these three entities constitute the overall framework for supporting the TEP projects. The historical and operational policies and the program are described in greater detail in this section, while the implementation of TEP itself is described in the following section.

1.2.1 The National Science Foundation

The National Science Foundation Act of 1950 (as amended) authorizes and directs the Foundation to initiate and support:

- **basic research** and programs to strengthen research potential, and
- science, engineering, and mathematics **education** programs at all levels (kindergarten through post-graduate studies).

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[1] *Materials in this section are adapted from NSF, Directorate for Science and Engineering Education. Teacher Preparation and Enhancement: Program Announcement and Guide, NSF-87-10.*

Since its inception, the National Science Foundation (NSF) has funded a wide variety of projects designed 1.) to enhance the quality and effectiveness of fundamental research in all major branches of sciences, and 2.) to promote the quality and effectiveness of science and engineering education in schools, colleges, and universities. Within this larger framework, financial support for basic and applied research has always been the Foundation's principal focus, with educational programs, per se, receiving a relatively small share of total NSF funds. Nevertheless, the increased priority assigned by NSF to educational activities over the past decade has resulted in a remarkable expansion in educational obligations. Funding for educational initiatives has increased from $23 million annually in Fiscal Year 1982, to $390 million in FY1992, an increase of 1600 percent (or over 1100% in 1982 constant dollars[1]). During this same period, total NSF funding increased from $1.1 billion to $2.8 billion which, when measured in constant dollars, constitutes slightly more than a two-fold increase. As a result, funds for all science and engineering education programs have increased as a proportion of total Foundation funds from 2.6 percent in FY1982 to 14 percent in FY1992.

NSF has established three major objectives for its support of educational programs:

- to develop and broaden the group of students who are well prepared and highly motivated to pursue **careers in science, mathematics, and engineering**, and to improve the quality of the educational experiences available to them;
- to widen the range of high-quality education offerings in mathematics, science, and technology at all levels, so that more students will be well prepared for (and have greater opportunity to choose among) **technically oriented careers in management and the professions**; and
- to deepen the general understanding of mathematics, technology, and science by present and future citizens for **life, work, and full participation in a technological society**.

The Foundation has unique familiarity and a special relationship with the science, mathematics, and engineering research and education communities in the Nation's laboratories, colleges, and universities, and it is especially interested in fostering the involvement of members of those communities in the design and implementation of innovative education projects.

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[1] *Data on NSF funding levels, and those funds allocated specifically for educational purposes, were provided by NSF. Constant dollar values were determined using the GNP implicit price deflator (See Science and Engineering Indicators - 1989. Appendix Table 4.1.)*

Because education is the responsibility of many institutions, NSF's strategy is to play a catalytic role that will enhance local efforts, bring to bear the skills and knowledge of the Nation's best scientists and educators, and engage the resources of both the public and private sectors. Therefore, NSF encourages partnerships in the projects it supports, including cooperative involvement among colleges and universities, local and state education agencies, cultural and professional institutions and societies, and business and industry. Such partnerships should be based on mutual interests and purpose, with all partners sharing not only in financing, but in the development, implementation, and follow-up activities growing out of collaboration.

Within this general framework, NSF seeks to leverage application of its resources and is strongly committed to the principal of cost sharing in its projects, both as evidence of importance to the proposing institution, and as an indication of continuing commitment and long-term impact. Cost sharing among collaborating partners is required in some programs and strongly encouraged in all others -- especially where the goals include the continuation and maintenance of project activities by local institutions or self-sustaining networks after NSF funding has terminated.

The Foundation is especially concerned about the under-representation of women, minorities, and the physically disabled in careers in mathematics, engineering, and the sciences. Projects involving members of these groups as principal investigators or staff, or as the target audiences, are especially invited to submit grant applications. Recognizing the importance of improving the overall quality of educational practices and curricula in the relevant disciplines, NSF is particularly interested in projects designed to test new approaches to increasing the numbers of students in such groups who are motivated to prepare themselves for careers in mathematics, science, and engineering.

1.2.2 The Directorate for Educational and Human Resources

Within NSF, the Directorate for Education and Human Resources defines and funds programs and projects that support NSF's educational mission. Operationalizing the broad missions of NSF, this directorate has four long-range goals to help ensure that:

- high quality primary and secondary education in science and mathematics is available to every child in the United States;
- those who select careers in science, mathematics, and engineering have available the best possible professional education in their disciplines;

- opportunities are available at the college level for interested non-specialists to broaden their science backgrounds; and,

- sufficient support is available for science education outside the classroom -- in order to encourage and maintain public interest in, and awareness of, scientific and technological developments.

At the time of this study, a variety of different divisions within the EHR directorate were assigned responsibilities to carry-out these mandates, including the divisions of: Research, Evaluation, and Dissemination (RED); Human Resource Development (HRD); Materials Development Research and Informal Science Education (MRD); Research Career Development (RCD); Teacher Preparation and Enhancement (TPE); and Undergraduate Science, Engineering and Mathematics Education (USE). The TEP program was operated by one of these divisions, Teacher Preparation and Enhancement.[1]

1.2.3 Division of Teacher Preparation and Enhancement

The Division of Teacher Preparation and Enhancement (TPE) was charged with responsibility for addressing persistent educational problems (such as lack of subject matter competence, the absence of adequate support systems, an inadequate reward structure, and shortages of well-prepared teachers) by supporting model pre-service and in-service teacher education programs, the creation of networks that provide support for teachers who are attempting to implement innovate science and mathematics programs, and a program of teacher awards.

A primary goal of TPE was to strengthen elementary and secondary science and mathematics education so as to provide all of the Nation's youth with a level of education that was both the highest quality attained anywhere in the world and reflected the particular and peculiar needs of our Nation. Special emphasis was placed on the elementary and middle/junior high school levels. Within this framework, TPE focused on teachers inasmuch as they served as models, motivators, and mentors -- the catalysts of the learning process.

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[1] *In 1994, the Directorate for Education and Human Resources is composed of the following divisions: Office of Systemic Reform (OSR); Division of Elementary, Secondary & Informal Education (ESIE); Division of Undergraduate Education (DUE); Division of Graduate Education & Research Development (GERD); Division of Human Resources Development (HRD); Division of Research, and Evaluation & Dissemination (RED). Teacher Enhancement & Development Programs are operated by the ESIE division.*

Teachers were seen as the agents for developing, exchanging, and replicating effective teaching materials and methods. The division's programs were designed to promote a cadre of teachers that were adequately prepared, highly motivated, and appropriately recognized and rewarded. A dual strategy was followed by TPE in order to achieve the Foundation's educational goals:

- It sought to support well-designed projects that would directly benefit the teacher/participants by making them more competent in the subject matter, more comfortable in its presentation, and more committed to their profession and their pupils; and
- It expected that projects would add to the base of knowledge about how teachers could most effectively be prepared and subsequently aided to enhance their capabilities.

To achieve these two goals, TPE supported individual projects that were likely both to accomplish related teacher improvement objectives and to contribute to the body of knowledge regarding effective models and methods for improving teacher quality and effectiveness. More explicitly, TPE encouraged projects that:

- capitalized on the prestige of the NSF grant and exploited the Foundation's unique familiarity and relationship with the scientific research and education community;
- stimulated collaboration among such partners as the Federal government, colleges and universities, state and local education agencies, business and industry, cultural institutions and media, scientists and science educators, and teachers, school administrators, and parents;
- resulted in self-sustaining networks among these varied elements -- cooperative patterns that would continue to function, supported by non-NSF funds; and
- focused resources, exerted high leverage, and used widely applicable approaches to strengthening science and mathematics education.

Within this framework, projects were sought that included the formulation, testing, and refining of non-routine approaches to the problems being addressed. A rationale that identified critical factors of the problem under study, and the approaches expected to produce the desired effects, was expected. Proposals were also expected to present a working model embodying these factors and approaches.

1.3 The Teacher Enhancement Program[1]

1.3.1 Goals and Objectives

The Teacher Enhancement Program (TEP) sought to improve the quality of instruction in science and mathematics by supporting programs designed to enhance teacher effectiveness while serving as prototypes for other in-service projects. The program recognized the need for elementary and secondary school science and mathematics teachers to continue their professional development and to renew their professional commitments.

The grants supported by TEP provided a variety of learning opportunities (primarily in the summer months) for elementary, middle/junior high, and senior high school teachers. Appropriate activities for participating teachers included, but were not limited to, courses, workshops, seminars, or research participation. In addition, many of the summer programs were followed by academic-year activities. The TEP projects offered opportunities for teachers to update their knowledge of disciplinary content, improve their pedagogical skills, and interact professionally with colleagues and other scientists, mathematicians, and engineers.

Specific TEP objectives were as follows:

- Stimulate the development, investigation, documentation and refinement of effective approaches and creative materials for the continuing education of elementary, middle/junior high and senior high school mathematics and science teachers.
- Provide teacher participants with opportunities to learn disciplinary concepts and processes and effective teaching methods;
- Identify outstanding classroom teachers who will develop leadership skills to assist in improving the teaching practices of their less well-prepared colleagues;
- Identify less well-prepared classroom teachers with demonstrated needs and expressed commitments to pursue professional development with the goal of improving their capacity for effective teaching;
- Support planned opportunities for teachers to share and work together in the local and/or regional settings to improve their own teaching under the continued guidance of the project staff;

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[1] *Materials in this section are adapted from several papers prepared by the staff of the Teacher Enhancement Program. The objectives of this program as described here are those under which these grants were conducted; new grants applicants may be subject to modifications in these specifications.*

- Provide incentives to establish continuing collaborative partnerships among faculties of schools, colleges and universities, and personnel from a variety of public and private organizations; and

- Help to attract the most talented individuals into education and give special attention to increasing access to careers in science, mathematics, and technology for currently under-represented populations.

Within these objectives, the scope of the program was broad. Professional development of the teacher was a major focus. The promotion of significant collegial relationships that allow the sharing of classroom experience and ideas with others was an important function of TEP projects. The projects provided information and incentives for participants to continuously construct and reconstruct the theoretical and practical bases for their teaching. Related to this, there was need for projects to stimulate an emphasis on teaching practices that are oriented to problem-solving approaches and constructive methods that are sensitive to the development of individual students.

Turning to program implementation, the individual projects were supposed to be designed so as to:

- Expand participants' knowledge of concepts and processes in science, mathematics, and technology;

- Deepen participants' knowledge and application of improved teaching methods, with special emphasis upon increasing their effective use of the laboratory in teaching science and a problem-solving focus in teaching mathematics;

- Increase teacher and school effectiveness in reaching groups of students who traditionally have been less involved in science and mathematics, including females, minorities, and the disabled; and

- Increase the potential impact that the project participants may have upon the improvement of science and mathematics programs in schools.

Directly following from this was the focus on teaching of students. Thus, an emphasis on classroom practices was important. Effective projects were expected to:

- seek improvement in both the subject matter knowledge and classroom practices of teacher participants;

- analyze, interpret, and report the characteristics of the approaches taken in providing learning experiences for teachers, and

- assess and document the nature and extent of changes caused by the project.

In order to multiply the impact of the Teacher Enhancement Program and to improve the quality of science and mathematics teaching in general, some projects were expected to:

- Identify outstanding classroom teachers who will develop leadership skills to assist in improving the teaching practices of their less well-prepared colleagues;
- Identify less well-prepared classroom teachers with demonstrated needs and expressed commitments to provide professional development activity to improve their competence for effective teaching;
- Support planned opportunities for teachers to share and work together in local and/or regional settings to improve their own teaching under the continued guidance of the project staff;
- Provide incentives to establish continuing collaborative partnerships among faculties of schools, colleges and universities, and personnel from a variety of public and private organizations.

1.3.2 Grant Application Requirements

In its instructions for grant applications, TEP specified a variety of characteristics that are sought. Among these were:

- the development of cooperative relationships among organizations with scientific and mathematics expertise to enhance development of a sound program, and the potential for exploiting the resources of these organizations in the service of continuing science education;
- creative approaches to continuing education that help teachers improve their professional self-concept, subject matter understanding, and pedagogical practices;
- effective project planning that includes the involvement of classroom teachers from the target population who have the appropriate expertise and background;
- the addressing of specific local or regional problems that are generalizable to the nation;
- the provision of hands-on sessions for teachers to expand their knowledge of science and mathematics concepts and processes;

- the provision to project participants of assistance in planning their own classroom uses of the subject matter concepts, teaching methods, and curriculum materials;

- the provision of continuing support to the teachers after they return to their classroom;

- commitments of support from local school administrations to continue efforts to improve classroom instruction in science and mathematics curricula; and

- clear plans for the evaluation of the impact of project activities upon participants and schools.

Public and private school teachers of science and mathematics at all levels of education were eligible to apply. Principal Investigators (PIs) were expected to select participants with demonstrated capacity and willingness to help colleagues needing instructional assistance -- thus spreading the impacts of the project to other teachers who have not had the opportunity to participate in the project. The project therefore was expected to help these teachers update their knowledge of the subject matter and pedagogical expertise as leadership teachers. Related to this, PIs assisted in establishing and maintaining the commitments of participants' home school systems to support these continuing leadership efforts.

The projects did not restrict their focus to leadership teachers alone. It was also important to select participants with demonstrated needs and expressed commitments to pursue intensive study of content matter and teaching methods, to engage them in appropriate professional studies of science and pedagogy, to provide them with workshop experiences with experienced colleagues, and to establish and maintain schools' commitments to further support the development of these teachers. Teachers from kindergarten, elementary, middle or junior high schools, and senior high schools were to be the principal participants.

Teacher Enhancement Project PIs were expected to recruit and select teachers to participate in their enhancement activities, based on the procedures proposed in their grant applications. Projects were targeted toward any level of pre-college teaching: elementary, middle/junior high, and high school teachers. Some projects recruited from several of these levels for different sets of activities, or cut across these groupings for the same program, for example, recruiting grade 4 to 8 teachers for graining in laboratory procedures for student activities. Projects were normally focused on either math or science enhancement, but science projects concentrated on a single science or cut across several scientific disciplines.

1.3.3 Eligibility Criteria and Limitations

Organizations with a scientific or educational mission were eligible to submit proposals. Among these were colleges and universities; state, regional, and local education agencies including school systems; professional societies; science museums and zoological parks; research laboratories; private foundations; private industry; and other public and private organizations, whether for profit or non-profit.

The Foundation considered proposals for support of educational activities in any field of science, including but not necessarily limited to astronomy, atmospheric sciences, biological sciences, behavioral sciences, chemistry, computer sciences, earth sciences, engineering, information science, mathematical sciences, materials science, oceanography, physics, and the social sciences. Interdisciplinary and multidisciplinary proposals were also eligible for consideration.

1.3.4 Grant Application Submission Process

NSF recommended that prospective applicants first submit a preliminary, five page proposal which set forth the ideas for the project. This informal proposal indicated the needs addressed by the project, how the project will meet these needs, the expected outcomes, who will carry out the work, what groups will be part of the network, plans for evaluation, estimated costs, and any cost-sharing that is planned. If NSF believed that the informal proposal was likely to meet the requirements for the program, a formal proposal was then requested. All formal proposals were peer-reviewed, and a final decision on funding among the competing proposals is the responsibility of the TEP program (with peer review comments playing an important role in this decision).

Proposals were typically submitted by February 1st with award periods to begin no earlier than August 1st of the same year, or by August 1st, with award periods to begin no earlier than February 1st of the following year.

1.3.5 Awards Criteria

Peer reviewers were asked to evaluate the merit of an individual proposal on the basis of four general criteria that reflected the overall goals and expectations of the program.

First, the **intrinsic merit** of the proposal was assessed, i.e., the likelihood that the project would lead to fundamental advances or have substantial impact on precollege mathematics, science, or technology education. Here, the concerns included the identification of an important need for the project by the Principal Investigator, whether he or she has appropriate knowledge and skills to address the need, and whether groups of special interest to NSF are included as prospective participants. The specific goals and objectives of the project were to be clear, and the scientific and educational merit were to be appropriate to the target audience.

Second, the **performance competence** were to be evident, including a well formulated and realistic plan for project initiation, implementation, completion, and evaluation design. Activities of the project were to be described together with the role of various persons or organizations in their implementation.

Third, the utility and relevance of the project was important. Did the project have the potential for significant impact not only on the participants but also for application in other settings? Did it yield educational products for developing, testing, and dissemination?

Finally, were there likely to be effects on the infrastructure of science and engineering, such as the formation of partnerships among various organizations during or after the project's implementation, contributions from such organizations to cover the costs (or in-kind contributions to project activities), and balance in the project's overall implementation plan.

In addition to these major criteria, other considerations included documentation and assessment of the project, recruitment and selection of participants, strengths of the proposed personnel, and overall budget.

1.3.6 Awards Between 1984 and 1989

Over 600 Teacher Enhancement Projects were funded between 1982 and 1989. As of 1989, more than 200 projects were being supported annually, with an appropriation from the Congress of approximately $50 million.

The grants supported by TEP provided a variety of learning opportunities (primarily in the summer months) for elementary, middle/junior high, and senior high school teachers. Appropriate activities for participating teachers included, but were not limited to, courses, workshops, seminars, or research participation. In addition, many of the summer programs were followed by academic-year activities. The TEP projects offered opportunities for teachers to update their knowledge of disciplinary content, improve their pedagogical skills, and interact professionally with colleagues and other scientists, mathematicians, and engineers.

Teacher Enhancement projects recruited and selected teachers to participate in their enhancement activities, based on the procedures proposed in their grant applications. Some projects recruited from several of these levels for different sets of activities, or cut across these groupings for the same program, for example, recruiting grade 4 to 8 teachers for training in laboratory procedures for student activities. Projects were normally focused on either math or science enhancement, but science projects concentrated on a single science or cut across several scientific disciplines.

The number of teachers per project was highly variable. A preliminary examination of data expected from the applications for FY 1989 awards showed a range of from a dozen participants to several hundred per project, with the majority of projects in the smaller range of from 20 to 60 teachers. Many projects selected a new group of participant teachers for successive summer workshop programs. Some teachers participated in more than one project, for example, where they were accepted for different projects in various years. The recruitment and selection of teachers may have been from a designated local area, such as one or more specific school districts; from a regional area or specific state; or from national recruitment procedures. It was estimated that roughly 10,000 teachers participated in TEP projects each year, with a total of more than 60,000 participants supported under FY1984 to 1989 awards.

NSF maintained limited statistical data on its TEP awards, recorded from the grant applications, regarding certain project characteristics.

Data were available for the period FY1984 through FY1989 regarding:

- number of TEP awards by fiscal year;
- funding by fiscal year;
- duration of award by fiscal year;

- the type of institution with which the awardee was affiliated;
- the academic level of institution;
- the level of degree awarded among institutions of higher education;
- highest degree of awardee;
- gender of awardees; and
- ethnic and racial distribution of awardees.

Collectively, these data offered a preliminary picture of these project characteristics.

Number of Awards

Between FY1984 and FY1989, NSF awarded a total of 599 TEP projects. In about a quarter of the cases, PIs received renewals of their grants, so the actual number of PIs was smaller than the number of awards. The distribution of the 599 awards between FY1984 and 1989, as shown in Table 1.1, tended to be rather uniform. Only in the initial year, and in FY1987, were the number of awards somewhat lower.

Funding Characteristics

As shown in Table 1.1, over the six year period covered, NSF obligated roughly $160 million for the 599 TEP awards[1]. However, the growth in federal obligations during this period was substantial; between 1984 and 1989, the annual obligations for TEP projects increased from $10.3 million to $41.4 million.

As shown in Table 1.1, the median size of awards was $186,125 Corresponding to growth in total funding, the median value of awards also climbed substantially (301%) during the period -- from $76,840 in FY1984 to $308,627 in FY1989. However, at the same time, the median monthly duration of awards was also lengthening, from 23 months during the first two years to between 29 and 33 months or above for the last four years. Thus, while the growth in median annual award value from $38,286 in FY1984, to $120,698 in 1989 was notable (about 215%), the rate of growth was somewhat less than the growth in total award value during the same period (about 302%).

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[1] *Data for six projects were unavailable for these analyses. In order to conduct these analyses, those projects were assigned the median value for all projects for the corresponding years. Thus, these analyses yield accurate figures for median awards data, but may under- or overestimate total annual funding by small amounts.*

Table 1.1

Selected Attributes of TEP Awards: FY1984-1989

Fiscal Year	No. of Awards	Percent	Total $ (000)	Median Award $	Median Duration (Months)	Median Annual Award $
1984	85	14.2%	$10,296	$76,840	23.0	$38,286
1985	112	18.7%	18,570	101,762	23.0	54,625
1986	100	16.7%	24,040	185,529	31.5	67,853
1987	87	14.5%	25,612	203,670	30.0	84,902
1988	102	17.0%	39,722	325,930	33.0	107,014
1989	113	18.9%	41,399	308,628	29.0	120,698
All Projects	**599**	**100%**	**$159,599**	**$186,125**	**28.9**	**$77,396**

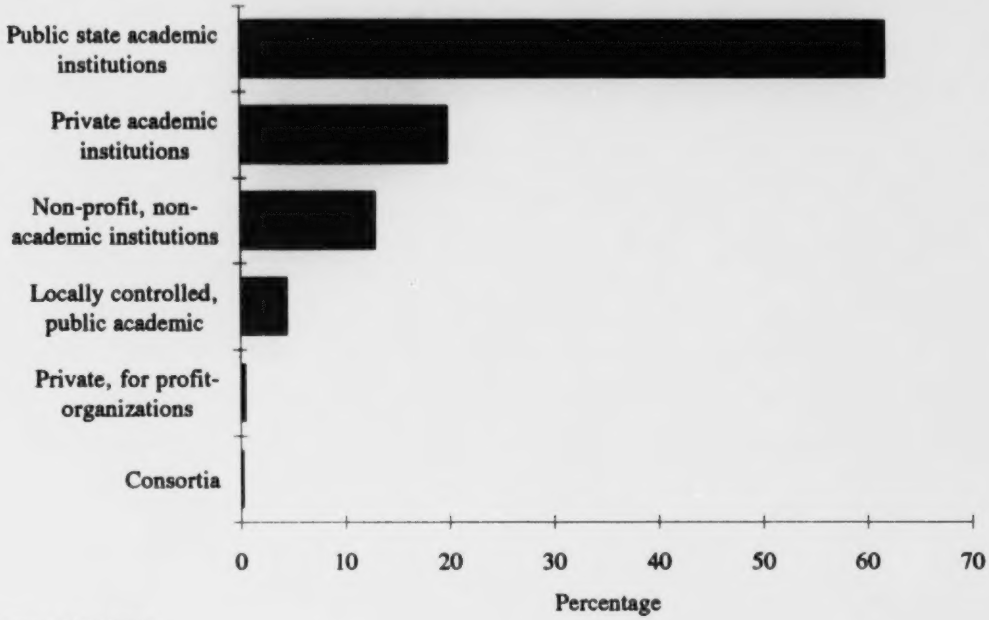
Institution Affiliation of PIs

Four out of five TEP awards were made to PIs located in institutions of higher education; of these, three quarters were located in public institutions and the remainder in private institutions. As shown in Figure 1.1, 62 percent of all TEP awards were to PIs in public institutions while 20 percent were to those in private institutions. Of the remaining TEP awards, 13 percent went to PIs in non-profit, non-academic institutions (e.g. museums, zoos), and less than five percent of those in locally controlled, public academic institutions. Less than one percent went to PIs in private, for-profit organizations and to consortia.

Academic Level of PI Institutions

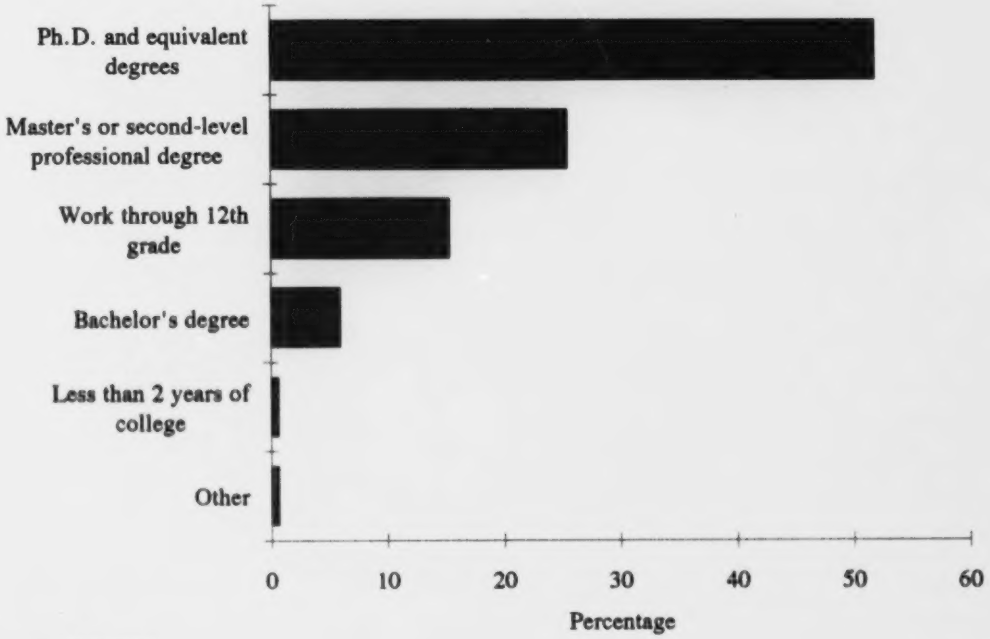
Within type of institution, where appropriate, NSF also classifies the academic level of institution. Among awardees located at degree granting institutions, 52 percent were located at institutions granting doctorate degrees, 26 percent at institutions granting up to the masters degree level, and six percent at primarily undergraduate institutions (see Figure 1.2). Roughly 15 percent of awardees were located at institutions that provided education through the 12th grade, and less than one percent of awardees were located at two year colleges.

Figure 1.1 - Type Institution of Awardees: FY 1984-1989



Source: NSF/TEP

Figure 1.2 - Academic Level of Institution of Awardees: FY 1984-1989



Source: NSF/TEP

Highest Degree Awarded at Institutions of Higher Education

Among the 370 awardees located at public institutions of higher education (as shown in Figure 1.3), fully two-thirds were at doctoral granting institutions, and another 30 percent at institutions where the master's degree was the highest degree awarded. Among awardees located at private institutions, 53 percent were at institutions awarding the doctorate, 25 percent were at institutions where the master's degree was the highest degree awarded, and 22 percent were at predominately undergraduate institutions.

Highest Degree of Awardees

Degree data were available for 443 awardees (three quarters of the population). For those awardees for whom data were available, on average, roughly nine in ten awardees held a doctorate; three quarters had earned a Ph.D. as their highest degree while 14 percent held an Ed.D. (see Figure 1.4). Of the remaining awardees, six percent held a master's degree, while six percent held a bachelors or other degree. These percentages fluctuated slightly over time.

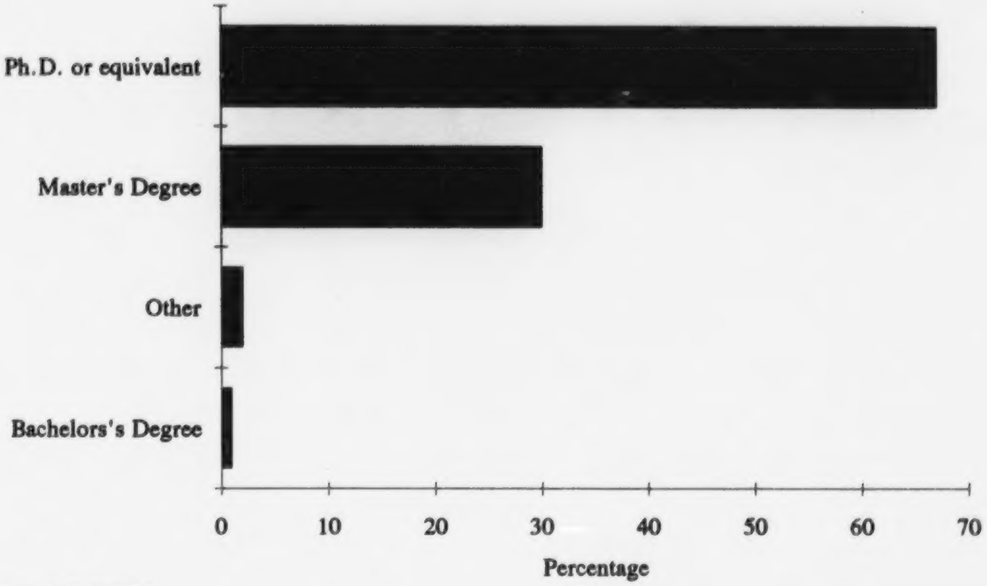
Gender of Awardees

On average, one in five awardees (PI or Co-PI) was female (see Figure 1.5). The highest percentage of female representation among awardees achieved was 23.5 percent in FY1988, and the lowest was 16.5 percent (during the first award cohort).

Ethnic and Racial Characteristics of Awardees

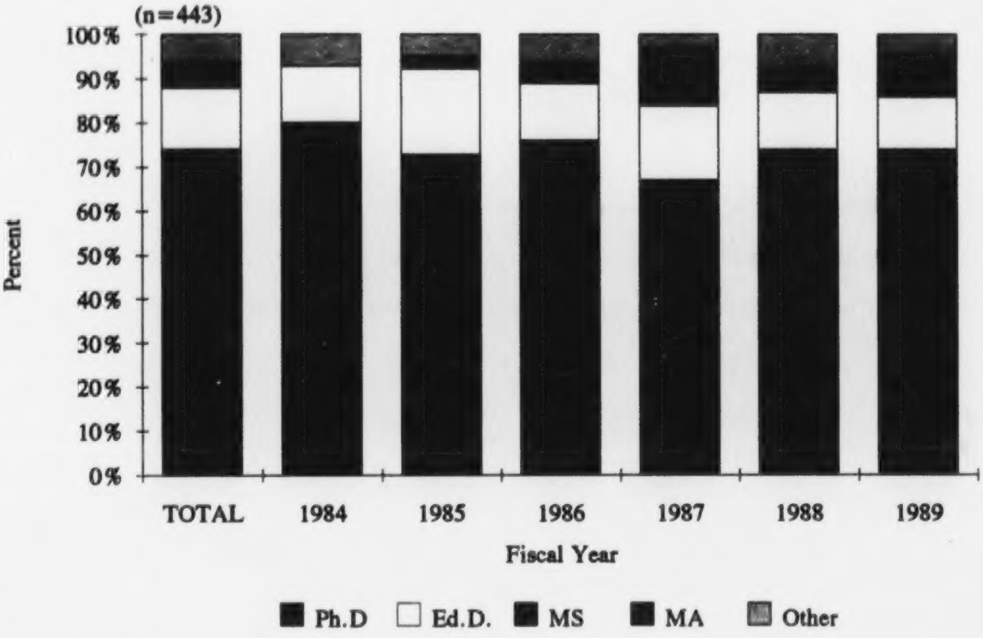
Data were available on PI race and ethnicity in seven out of ten cases. As shown in Figure 1.6, for those for whom ethnicity or race data were available, more than nine out of ten awardees were white (non-Hispanic). The largest single minority awardee group was Black, representing four percent of known cases. While this proportion is quite small, it has increased over time -- from one to five percent of awards where this characteristic was known. Hispanic and native American representation was quite low. Asians made up less than one percent of known cases. While Asian PIs are not under-represented among all NSF grantees, they are proportionately under-represented among PIs in the TEP program to their participation in all NSF awards.

Figure 1.3 - Highest Degree Awarded by Institution of Awardees: FY 1984-1989



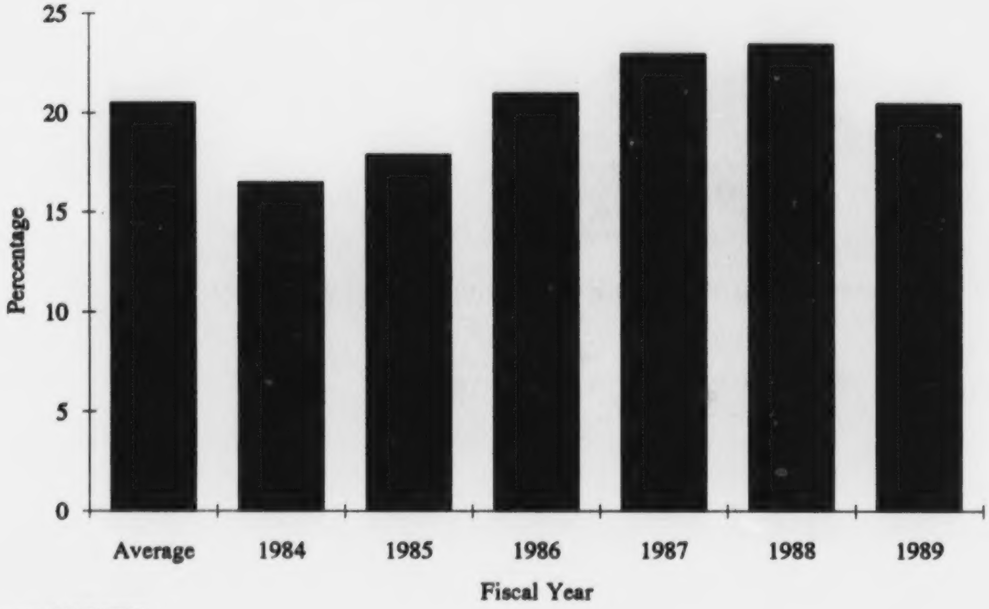
Source: NSF/TEP

Figure 1.4 - Highest Degree Attained by Awardee: FY 1984-1989



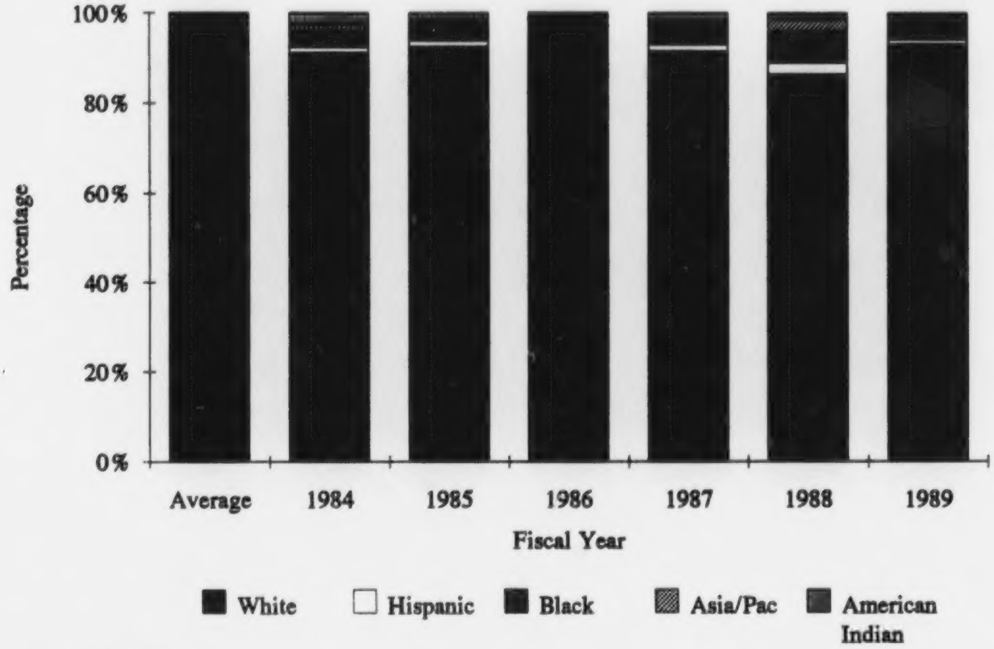
Source: NSF/TEP

Figure 1.5 - Gender of Awardees: 1984-1989



Source: NSF/TEP

Figure 1.6 - Race and Ethnicity of Awardees: FY1984-1989



Source: NSF/TEP

Characteristics of FY1987-1989 Awards

More detailed data are available on several additional variables for 302 TEP projects awarded for the period FY1987 through FY1989:

- Disciplinary emphases of projects;
- Projects having a gender emphasis toward females;
- Projects likely to serve participants who teach minority students;
- Projects likely to serve participants from economically disadvantaged areas;
- Projects directed toward gifted teachers; and
- Projects likely to serve participants with physical disabilities.

Disciplinary Foci of Projects

Since the FY1987 through FY1989 data represent only three years, they were combined for all years in order to identify the most typically represented disciplines. As shown in Table 1.2, almost all applicants identified a principal field of emphasis, about two-thirds also identified a secondary field of emphasis, while one-third identified a tertiary field.

A particular field of science was reported as the principal emphasis among three-quarters of the TEP awards, with the remaining quarter of applicants emphasizing mathematics. Among the sciences, principal emphasis on physical sciences was reported by 35 percent of the PIs (with 15% emphasizing chemistry and 14% emphasizing physics). Biology was the principal field of emphasis for 15 percent of the PIs, while earth sciences (principally geology) accounted for 10 percent. Almost no TEP PIs emphasized engineering sciences, social sciences, or psychology. With respect to secondary emphases, physical sciences and "other science" were the most likely to be chosen as a secondary emphasis; either mathematics or computer sciences was cited in seven percent of the cases.

Emphasis on Participants Serving Specific Student Populations

Since FY1987, NSF flagged project records to indicate if the project focused on a particular group to a degree beyond the group's normal representation in the general population. As shown in Figure 1.7, 21 percent of awarded projects emphasized women, 26 percent emphasized recruitment of participants from school districts that serve minorities, seven percent expected to recruit participants from economically disadvantaged areas, three percent emphasized

Table 1.2

Substantive Foci of TEP Awards: FY1987-1989

(n = 302)

Disciplinary Area:	Primary Emphases (99%)	Secondary Emphases (66%)	Tertiary Emphases (33%)
Astronomy	4.6%	0.7%	1.0%
Chemistry	14.9%	10.6%	3.6%
Physics	13.9%	7.6%	7.0%
Other Physical Science	1.3%	1.3%	1.0%
Mathematics	25.2%	3.3%	3.0%
Computer Science	2.3%	4.0%	1.7%
Atmospheric Science	1.0%	0.3%	
Geological Science	6.6%	3.3%	2.7%
Biological Oceanography			
Phys/Chem Oceanography			
Ecology	1.0%	0.7%	0.3%
Environmental Science	1.0%	2.7%	2.3%
Aeronautical Engineering			
Astronautical Engineering			
Chemical Engineering			
Civil Engineering		0.3%	
Electrical Engineering			
Mechanical Engineering			
Materials Engineering			
Other Engineering		1.0%	0.7%
Biology	13.9%	5.0%	
Clinical Medicine			
Other Life Science	3.3%	1.0%	0.7%
Biological Psychology			
Social Psychology			
Other Psychology		0.3%	

(continued)

Table 1.2 (cont.)

Substantive Foci of TEP Awards: FY1987-1989

(n = 302)

Disciplinary Area:	**Primary Emphases**	**Secondary Emphases**	**Tertiary Emphases**
Anthropology			
Economics			
History			
Linguistics			
Political Science			
Sociology			
Law			
Geography			0.7%
Other Social Science	0.3%		
Science/Technology Assessment			
Science Policy			
Other Science NEC	9.3%	24.5%	6.3%
Emphasis not indicated	1.0%	34.4%	66.9%
Total	**100%**	**100%**	**100%**

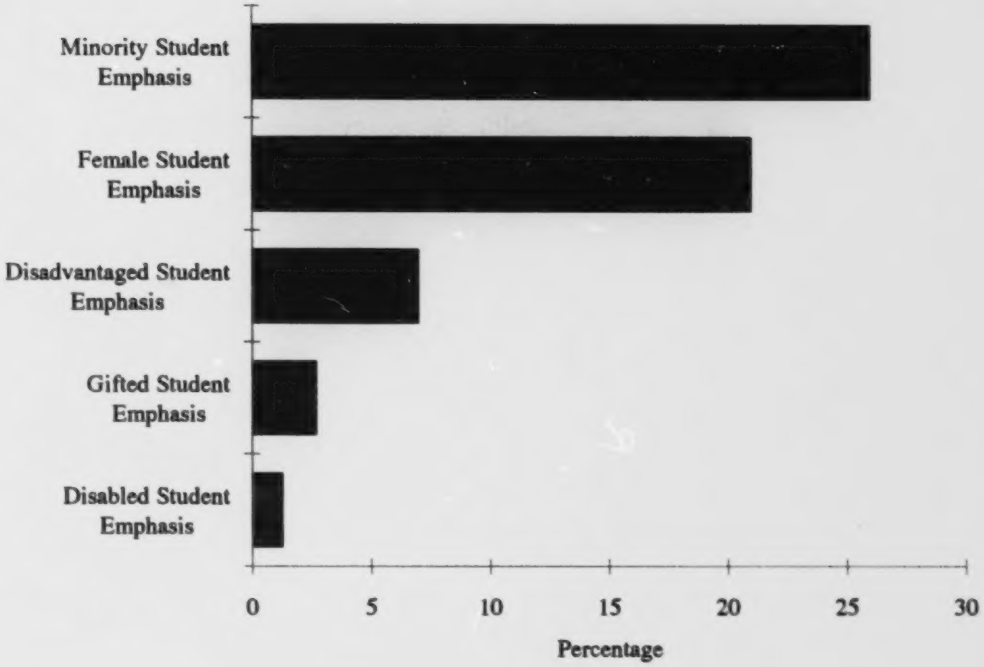
involving gifted teachers as participants, and one percent expected to serve participants with physical disabilities.

1.4 The Study Objectives and Population

1.4.1 The Division of Research, Evaluation and Dissemination's Mission as the Study Context

The rapid increase in national interest in improving the nation's science and mathematics education has been reflected at the National Science Foundation through a very rapid expansion in the proportion of its budget that is allocated specifically for educational improvement. The Congress, in allocating these funds, expressed considerable interest not only in providing support for innovative programs designed to improve the teaching of science and mathematics subject matter, but also in the conduct of periodic and systematic evaluations of the programs being supported. In particular, there is a concern that the best practices be identified and documented, and that what is learned be disseminated to the appropriate audiences.

Figure 1.7 - Selected Participant Emphases
(Percent of Awards)



The Congress is concerned about the condition of science and mathematics education in the United States and with the return on the nation's investment in this area. For this reason, Congress has requested that the National Science Foundation develop a plan to evaluate all of its mathematics and science education programs. The evaluation of the Teacher Enhancement Program is part of that comprehensive evaluation effort.

The Division of Research, Evaluation, and Dissemination (RED) of the EHR Directorate is charged with overseeing evaluation efforts and related studies pertaining to teacher enhancement, and with dissemination of findings to the appropriate policy, program, and practitioner communities. RED is also responsible for assuring that the evaluation methodologies employed both reflect the state-of-the-art available from the broader evaluation community (irrespective of particular context in which such methods are drawn), as well as with the effective application of these techniques specifically in the science and mathematics education context.

1.4.2 Objectives of the Evaluation

In initiating this evaluation, RED posed a number of questions regarding the effects of participation in projects supported by the NSF Teacher Enhancement Program:

1. What are the **background characteristics** of the participating teachers? What was their experience in teaching science and/or math prior to the TEP workshop? Elementary, middle or secondary level teaching experience? Their formal education? Prior summer or other math/science workshops? Demographic characteristics, such as racial/ethnic group and gender? What proportion of the participant's teaching load is relevant to the workshop content?

2. What was the **nature of the activities** in the TEP workshop(s) attended? Did participants learn new content subject matter? In what fields? What teaching methods were used in the workshop(s) attended? What teaching methods for elementary or secondary science were taught in the Workshop?

3. What **teaching materials**, if any, were introduced or developed in the TEP workshop? Were these developed by the workshop participants, or from other sources?

4. What was the **participants' assessment** of the value of the TEP workshop(s)? Which aspects do they feel were most helpful to their science/math teaching? Would they encourage other teachers to attend a similar workshop?

5. To what extent have the **workshop contents, activities, and/or materials been used in the participants' classrooms** since returning? To what extent has the participant used the workshop content or methods in classroom teaching? What aspects of their teaching changed from before the workshop, as a result of the TEP project?

6. Do the teachers believe there has been **increased student interest and/or achievement in science/math** since the teacher's participation in the TEP workshop? Increased student enrollment in elective science courses at the secondary level? Increased participation in Science Fairs, science clubs, or science/math competitions?

7. How has participation in TEP influenced the **participants' career development**? What proportion of participants have increased their enrollment in formal college-level courses in math/science? Have participants increased the extent of their leadership roles in their school or district in science/math or their leadership roles in professional associations? What proportion of participants have left education for another career field?

8. To what extent is there a multiplier effect, in which participants **disseminate their TEP learning to other teachers**, and/or other districts? Have TEP participants assumed leadership roles in local in-service activities in science and math education and/or in activities in professional associations? Are they active in later TEP or other science/math workshops as an instructor? If so, approximately how many other teachers have participated in these activities?

9. To what extent is enhanced science and/or math teaching **integrated into more comprehensive school or district-wide efforts**? Was the teacher's participation in the TEP project part of a wider plan for improved instruction? What support did the participant receive from the local school or district for using the methods/content recommended by the TEP project? What barriers do teachers perceive that inhibit their using the TEP methods/materials in their classrooms?

In addition, the present study stands to benefit from analyzing the relationship of findings from the survey of participants with those of an earlier study performed of the Principal Investigators who directed the TEP project. By "linking" the two data bases (by means of the award number shared by all projects and their respective participants), it is possible to both document the congruity of answers to like questions, and to document relationships between participant experiences and the objectives of the PIs for the projects in which they participated. Since these two studies are being linked, information is provided later in this chapter on the earlier survey as well (following discussion of the present participant survey study).

1.4.3 The TEP Participant Survey Population: FY1984-1989

During the period between FY1984 and 1989, NSF awarded 599 grants to Principal Investigators for the conduct of TEP projects. In a number of cases, PIs from the earlier years of the program submitted applications for a second grant which was awarded. The total number of individual PIs receiving one or more grants was 461; thus, roughly one-quarter of all awardees were recipients of two TEP grants.

Based upon the recent survey of PIs receiving grants from NSF for the conduct of TEP projects, it was estimated that a total of 63,000 teachers participated in TEP projects awarded by NSF between 1984 though 1989.[1]

1.5 Survey Questionnaire

The participant questionnaire developed for this project was shaped by the following considerations:

- The **national education context** with respect to problems in the science and mathematics performance and achievement levels of pre-college students (as discussed in Section 1 above);
- The original **TEP program objectives** as established by the Congress, NSF, and the Education and Human Resources directorate (as discussed in Sections 2); and
- The **TEP program administration and operations** characteristics (as discussed in Section 3).
- The **evaluation objectives** for the study with respect to both past projects assessment and future program and policy decisions (as discussed in Sections 1 and 4 above).

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[1] *In a recent survey by Abt Associates of 599 TEP awardees from the period FY1984 through 1989, 449 (or 75 percent) PIs responded. The estimate of 63,000 project participants for these awards is based upon a weighted estimate for the total population of awardees.*

The questionnaire sought to obtain information on a wide variety of evaluation topics so that the accomplishments of the TEP projects could be documented and various issues and problems that may have occurred could be identified and understood. A principal concern was that learning from this study be applicable to future policy, resource allocation, and program operations decisions regarding TEP.

The survey questions focused on the participants' reactions to the TEP project itself, their self-reported learning from the project, their use of components from the TEP project in their classrooms, the reactions and science/math activities of their students, and the extent of a multiplier effect by transferring or disseminating their learning to other teachers.

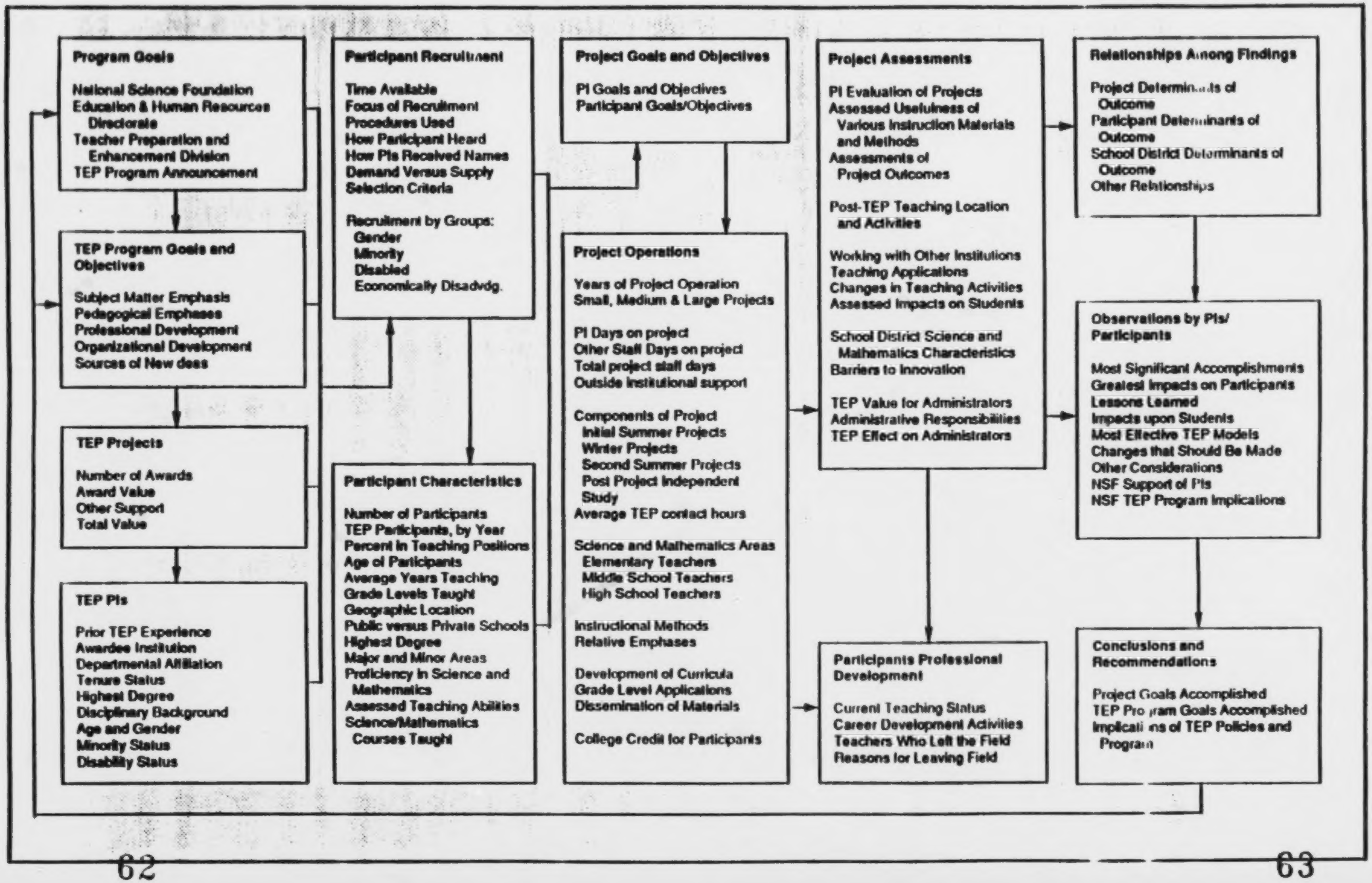
Based upon a careful review of these various facets TEP, a series of questionnaire items were developed concerning:

- Participants' **recruitment experiences** and their **goals and objectives for participation** in their TEP project;
- Characteristics of **science and mathematics education in participant's own school districts**;
- **Personal and professional characteristics of the participants**;
- **Characteristics of their TEP Projects** (e.g., when held, amount of instruction provided, subject matter focus, teaching methods);
- **Assessments of their projects** (e.g., effectiveness of various teaching methods, usefulness of what was learned to classroom activities, relevance of TEP project to their specific goals and objectives for participation, subsequent partnerships established with other parties involved in science and mathematics education;
- Impacts of participation on **their methods of instruction** (e.g., teaching methods, student activities in science);
- Follow-up activities by participants that would **leverage the effects of the TEP projects** on a wider groups of teachers;
- **Career and teaching activities of the participants** before and after the TEP experience;

More detailed information on the various topical areas included in the questionnaire appears in Figure 1.8.

Figure 1.8

Analytic Logic for the Survey of Teacher Enhancement Program (TEP) Participants
(Incorporating data from the 1989 Survey of TEP Principal Investigators)


Program Goals
National Science Foundation
Education & Human Resources Directorate
Teacher Preparation and Enhancement Division
TEP Program Announcement
TEP Program Goals and Objectives
Subject Matter Emphasis
Pedagogical Emphases
Professional Development
Organizational Development
Sources of New deas
TEP Projects
Number of Awards
Award Value
Other Support
Total Value
TEP PIs
Prior TEP Experience
Awardee Institution
Departmental Affiliation
Tenure Status
Highest Degree
Disciplinary Background
Age and Gender
Minority Status
Disability Status
Participant Recruitment
Time Available
Focus of Recruitment
Procedures Used
How Participant Heard
How PIs Received Names
Demand Versus Supply
Selection Criteria
Recruitment by Groups:
Gender
Minority
Disabled
Economically Disadvdg.
Participant Characteristics
Number of Participants
TEP Participants, by Year
Percent in Teaching Positions
Age of Participants
Average Years Teaching
Grade Levels Taught
Geographic Location
Public versus Private Schools
Highest Degree
Major and Minor Areas
Proficiency in Science and Mathematics
Assessed Teaching Abilities
Science/Mathematics Courses Taught
Project Goals and Objectives
PI Goals and Objectives
Participant Goals/Objectives
Project Operations
Years of Project Operation
Small, Medium & Large Projects
PI Days on project
Other Staff Days on project
Total project staff days
Outside institutional support
Components of Project
Initial Summer Projects
Winter Projects
Second Summer Projects
Post Project Independent Study
Average TEP contact hours
Science and Mathematics Areas
Elementary Teachers
Middle School Teachers
High School Teachers
Instructional Methods
Relative Emphases
Development of Curricula
Grade Level Applications
Dissemination of Materials
College Credit for Participants
Project Assessments
PI Evaluation of Projects
Assessed Usefulness of Various Instruction Materials and Methods
Assessments of Project Outcomes
Post-TEP Teaching Location and Activities
Working with Other Institutions
Teaching Applications
Changes in Teaching Activities
Assessed Impacts on Students
School District Science and Mathematics Characteristics
Barriers to Innovation
TEP Value for Administrators
Administrative Responsibilities
TEP Effect on Administrators
Participants Professional Development
Current Teaching Status
Career Development Activities
Teachers Who Left the Field
Reasons for Leaving Field
Relationships Among Findings
Project Determinants of Outcome
Participant Determinants of Outcome
School District Determinants of Outcome
Other Relationships
Observations by PIs/ Participants
Most Significant Accomplishments
Greatest Impacts on Participants
Lessons Learned
Impacts upon Students
Most Effective TEP Models
Changes that Should Be Made
Other Considerations
NSF Support of PIs
NSF TEP Program Implications
Conclusions and Recommendations
Project Goals Accomplished
TEP Program Goals Accomplished
Implications of TEP Policies and Program

In addition to posing a series of structured questions regarding these various subjects, a series of open-ended questions were posed asking PIs to make observations in their own words. The open-ended questions concerned:

- the most significant accomplishments of the projects in terms of participants science and mathematics teaching;
- any particular "models" for teacher enhancement projects that appear to have special promise;
- changes that participants would like to see made in the TEP project if they were going to participate in the project another time;
- any other general points they would like to make about their TEP projects;
- the extent to which participants believe that they personally are committed to changes in science and mathematics instruction, and the most important change that they would like to see; and
- suggestions to NSF on ways to improve the overall TEP program.

Since a comprehensive questionnaire that achieved the objectives of the study could trade-off against a high response rate (i.e., if a questionnaire is too long or complex, response rate may be reduced), considerable care in the design of the questionnaire was given to the wording of the individual items and response categories, their grouping, and sequence, the use of skip patterns (where a given item may not be relevant to a particular respondent), and limited use of open-ended items.

The questionnaire contained a total of 46 questions (some with sub-questions) and, of these, 13 were open ended. A complete copy of the questionnaire with accompanying instructions appears in Appendix A of this report.

1.6 Survey Methodology

1.6.1 Survey Pre-testing

Once the preliminary questionnaire was finalized, it was pre-tested with nine TEP project participants in order to identify any difficulties with the instructions, item wording, and response categories, and to determine the amount of time required to complete the instrument. Interviews were then conducted with the pre-test PIs regarding any problems they had with the questionnaire and to obtain their suggestions regarding improvements in the instrument. The average pretest respondent required 45 minutes to fill in all items. The final questionnaire, instructions, and materials on the purposes and procedures of the study were submitted to the Office of Management and Budget (OMB) for approval.

1.6.2 Sample Selection and Weighting Procedures

The primary objective of the sample design was to provide reliable estimates for several key domains of the target population. To accomplish this, a disproportionate stratified sample of project participants was drawn. An initial examination of the project participants by the stratification variables indicated that the distribution is not uniform. Therefore, a proportionate, stratified sample was used to develop a small sample for several of the key domains. The seven stratifiers are shown below:

Level Taught -- elementary; middle; secondary; mixed.

Content -- science; math; both.

Project Size -- 1-40; 41-75; 76-150; 150+.

Post-Project Followup -- yes; no.

Recruitment -- local only; local and regional; local, regional and national.

Minority Representation -- small; medium; high.

Cohort -- 1984-1985; 1986-1987; 1988-1989.

While reliable estimates were needed for the categories of each stratifier, separate estimates were not required for the individual strata formed by the cross-classification of the seven stratifiers. Using an iterative sample allocation procedure appropriate for this type of stratification design, the sample size of project participants allocated to the categories of each stratifier is shown below[1]:

Level Taught:

Elementary	767
Middle	767
Secondary	767
Mixed	767

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[1] *Winkler, W., 1986, "Multi-Purpose Survey Sampling", Proceedings of the Section on Survey Research Methods of the American Statistical Association, pp. 618-623.*

Content:	
Science	1,023
Math	1,023
Both 1,023	
Project Size:	
1-40 767	
41-75	767
76-150	767
150+	767
Post-Project Followup:	
Yes	1,533
No	1,533
Recruitment:	
Local	1,023
Regional	1,023
National	1,023
Cohort:	
1984-1985	1,023
1986-1987	1,023
1988-1989	1,023

The estimation procedure involved assigning a basic sampling weight to each sample project participant. On a stratum-by-stratum basis, a nonresponse adjustment to the weights of the responding project participants was made. After this step had been completed, estimates in the form of means, totals and proportions were derived from the weighted sample. It was necessary to apply the weights when multi-variate techniques were employed.

The sample allocation was designed to yield domain estimates that have 95-percent confidence limits, for a survey percentage equal to 50 percent, that are no larger than plus or minus 5.0 percent. Shown below are the 95-percent confidence expected for each domain of interest to the study. The figures shown below incorporate a design effect factor to reflect the increase in sampling variance from the weighting of the sample.

Level Taught:

Elementary	+/- 5.0%
Middle	+/- 5.0%
Secondary	+/- 5.0%
Mixed	+/- 5.0%

Content:

Science	+/- 4.3%
Math	+/- 4.3%
Both	+/- 4.3%

Project Size:

1-40	+/- 5.0%
41-75	+/- 5.0%
76-150	+/- 5.0%
150+	+/- 5.0%

Post-Project Followup:

Yes	+/- 3.5%
No	+/- 3.5%

Recruitment:

Local	+/- 4.3%
Regional	+/- 4.3%
National	+/- 4.3%

Cohort:

1984-1985	+/- 4.3%
1986-1987	+/- 4.3%
1988-1989	+/- 4.3%

The overall national estimate is expected to have 95-percent confidence limits of plus or minus 2.5 percent.

No specialized sampling techniques other than the disproportionate sample allocation were required.

Maximizing Response Rates

Care was taken in the design of both the questionnaire and administration procedures to ensure the achievement of planned response rates. Attention has been devoted to brevity, wording, format and appearance of the instrument, as well as ease of response. In addition, a cover letter from a senior NSF official urging the TEP participant's cooperation will accompany the survey. Subsequently, follow-up steps, including a second mail-out to all nonrespondents, will be taken.

The sample design described above was intended to yield reliable estimates for the population as a whole. as well as for the analytic domains of interest defined by the seven stratification variables.

1.6.3 Conduct of Survey

Once OMB approval for conduct of the survey was received, those participants included in the sample for this study (discussed below) was mailed a complete survey package in late October, 1991. This package contained a cover letter from the Assistant Director of Education and Human Resources, Directorate of NSF, that discussed the survey objectives and encouraged prompt completion and return of the questionnaire; a copy of the questionnaire; and a pre-addressed, business reply return envelope. The name of the Abt Associates survey director together with a toll-free 800 number were provided in the cover letter for recipients' convenience in obtaining answers to questions they might have.

Two weeks following the initial survey letter, a follow-up "thank-you/reminder" card was sent, thanking those who had already completed the survey for doing so and reminding those who had not to complete and return the survey as soon as possible. Subsequently, a second and third reminder letter were sent out at two week intervals to enhance response rates.

1.6.4 Data Entry

As returned survey questionnaires were received, each was logged in order to track response rates and send follow-up reminder letters to nonrespondents. Each questionnaire was edited prior to data entry to assure that all responses to the closed-ended items were understandable. Any problems identified thus were addressed prior to data entry.

In addition, for all items that used an open-ended format, the first 100 written responses were recorded and a content analysis performed. For each opened-ended item, a set of descriptors were developed for purposes of assigning codes to each written response. Once all codes were completed, the entire set of open-ended items in all questionnaires were then coded and readied for data entry. Coders were trained in the use of these coding schemes and supervised through the coding process to assure coder reliability.

Questionnaires that had been edited and coded were entered and 100 percent verified (that is, entered again to assure accurate date entry). Once all files in the data base were entered, the data base was checked for any out-of-range values or other anomalies that would interfere with data processing, and then it was fully documented.

1.6.5 Sample Response and Weighting

The participant sample was selected from a roster of participant names and addresses provided by awardees. Questionnaires were mailed to selected participants. The probability that a given individual would provide a response suitable for analysis depended on three factors:

1) The probability that his or her awardee would respond to the rostering request;

2) The probability that a rostered individual's name would be sampled for mailing; and

3 The probability that a mailed instrument would be returned.

Rostering information was provided by 57 percent (347) of the 604 known awardees. Analysis of the pattern of responses to the rostering request indicated that awardee response rate was related to the size of the award, the difference between amount proposed and amount awarded, and the end date of the award. A logistic regression was estimated using response as the dependent variable and these award characteristics as independent variables. The reciprocal of the response probability so estimated was taken as the award weight.

Awardees (and the associated participants) were grouped according to the following seven stratifying attributes:

Attribute	**Levels**		
Grade level	Elementary	Middle/ Sr. High	Mixed/ Missing
Subject matter	Math	Science	Both/ Missing
Teacher participants	<40	40-99	100+ / Missing
Follow up	Some	None/ Missing	
Recruitment	Local	Regional/Missing	
Cohort	84-85	86-87	88+ / Missing
Minority participants	<10%/ Missing	10% to 24.9%	> = 25%

The sample of participants was drawn using an iterative sample allocation procedure intended to provide approximately equal numbers of participants at each level of each attribute. Since the actual population of participants varied considerably from stratum to stratum, equal allocation implied substantially different sampling probabilities for different individuals.

Table 1.3 shows the number of survey instruments mailed and the number of responses returned in each major group of awards. Over all, 59% of those who were eligible to respond returned a completed (or partially completed) questionnaire. The response rate varied only slightly among the major groups of awards, suggesting that there was little response bias due to possible differences in award characteristics.

Tables in this report are based on data weighted to adjust for differing probabilities that a participant would be included in the study. The weights were computed as the product of the award weight described above times the ratio of the number of participants in a stratum to the number of responses actually received in that stratum. Thus the numbers shown are unbiased estimates of the characteristics of the total population. (The tables in Chapter 10 are based on unweighted data to facilitate significance testing of observed associations.)

1.7 Data Analysis

Much of the logic that guided the analysis is suggested in Figure 1.8 above, wherein certain data may be considered as independent variables (pre-program and PI characteristics), others as program (or treatment) variables, and still others as dependent variables (where questions pertain to program assessment and outcomes).

Data from this survey were also linked with specific data from the companion survey of project Principal Investigators, particularly data describing project activities, scope, length of contact with teachers, and teaching methods. This permitted analysis of the extent to which variation in project emphases and/or activities was associated with subsequent differences in teachers' behavior or outcomes (self reported) and/or with changes in their classroom teaching or in outcomes for their students. For example, it was hypothesized that teachers from projects that include more extensive follow-up activities during the school year would report more change in their classroom behavior, than would be found among teachers from projects without follow-up activities.

Table 1.3

Number of Participants in Sample and Number Returning Questionnaires, by stratum

	Number of sampled individuals	Number of inappropriate mailings	Number of Returned Responses	Response Rate
All awards	**4309**	**225**	**2396**	**59%**
Grade level				
Elementary	759	22	390	53%
Middle/ Sr. High	1429	19	929	66%
Mixed/ Missing	2121	184	1077	56%
Subject matter				
Math	882	37	498	59%
Science	996	30	628	65%
Both/ Missing	2431	158	1270	56%
Teacher participants				
<40	1182	40	676	59%
40-99	1267	30	737	60%
100+ / Missing	1860	155	983	58%
Follow up				
Some	1289	45	647	52%
None/ Missing	3020	180	1749	62%
Recruitment				
Local	1238	49	672	57%
Regional/Missing	3071	176	1724	60%
Cohort				
84-85	911	33	509	58%
86-87	1000	27	611	63%
88+ / Missing	2398	165	1276	57%
Minority participants				
<10%/ Missing	1807	151	1000	60%
10% to 24.9%	1240	28	721	59%
> = 25%	1262	46	675	56%

Essentially, three types of analyses were performed. First, the distributions of responses for each item were determined. In the case of open-ended responses, special exhibits are provided to let the PIs "speak for themselves."

Second, a series of relationships among the variables were examined (e.g., do differences in project outcomes arise as a function of size of award, specific goals and objectives of the projects, characteristics of the PIs, characteristics of the participants, participation in the TEP projects by other science organizations, and so forth).

Finally, classification analyses are used to track various relationships among clusters of items (e.g., concerning participation by females, by minority groups, or differential effectiveness of mathematics and science methods and materials).

1.8 The Earlier Survey of TEP PIs

Inasmuch as data from the present study of participants are related to data from an earlier study of the TEP PIs, it is necessary to provide a brief overview of the earlier study, its objectives, the information gathered, and related information.

1.8.1 Objectives of the TEP PI Evaluation

Just as the present survey of participants had specific evaluation objectives, so too did the earlier study of PIs. In initiating this earlier PI study, RED posed a number of questions regarding the NSF Teacher Enhancement Program:

1. **What are the characteristics of the teachers served by the program?** How are they distributed by gender, race, and geographic region? How are the participants divided by subject field and educational level?

2. **What variations in in-service education structures and strategies have been used in the TEP projects?** Are some strategies perceived by teachers to be more effective than others? How do these strategies compare with the methods used by other in-service education programs for science and math teachers?

3. **What types of educational materials (for teachers and for students) result from Teacher Enhancement projects?** How are these materials disseminated to teachers? Are the materials adopted by individual teachers and by school systems? Are these materials as effective for classroom use as professionally developed science and math teaching materials?

4. **Do Teacher Enhancement projects address the special needs of students from groups under-represented in mathematics and the sciences?** Do they present relevant information on females, minorities, and the disabled? Do they present effective strategies for enhancing the performance of these students in mathematics and science?

5. **How do Teacher Enhancement projects affect teachers' knowledge and understanding of mathematics/science?** Do teachers learn about significant new development in science/math that they can incorporate into their courses? Do teachers feel more qualified to teach students about various math/science subjects after participating a TEP project?

6. **What effects do Teacher Enhancement projects have on teachers' classroom performance?** Do teachers alter their teaching strategies after participating in a TEP project? Do they incorporate new instruction materials and activities into their classes. How do the strategies learned in TEP project coordinate with other curricula and materials used in the teachers' home districts?

7. **What impact do Teacher enhancement projects have on students?** Do students interested in science/math change after their teacher has participated in the TEP project? Does their performance in math and science courses change in any way?

8. **Do Teacher Enhancement Projects affect teachers' career development? Do the projects renew teachers' enthusiasm for science/math teaching?** Do they encourage teachers to get involved in other types of professional development activities?

9. **Do Teacher Enhancement projects have a ripple effect?** Do TEP participants offer in-service training programs and individual consultations for their colleagues? Are materials and instructional methods presented in TEP projects incorporated into the curricula of school systems? What interactions have occurred among TEP projects and with state and local science and math curricular developments?

10. **Do the outcomes of Teacher Enhancement projects become institutionalized?** Do TEP projects or elements of projects continue after NSF funding stops? Do schools and school systems incorporate aspects of TEP projects into their educational programs?

1.8.2 The TEP Survey Population: FY1984-1989

During the period between FY1984 and 1989, NSF awarded 603 grants to Principal Investigators for the conduct of TEP projects. In a number of cases, PIs from the earlier years of the program submitted applications for a second grant which was awarded. The total number of individual PIs receiving one or more grants was 461; thus, roughly one-quarter of all awardees were recipients of two TEP grants.

Since there were only 603 awards (a total of 461 PIs), and questions were raised regarding a number of issues about various sub-groups of the population (e.g. cohort years, mathematics versus science awards, gender, minority status), it was determined that a full census of all PIs would be conducted. Any sampling procedure might have reduced the number of respondents to an unacceptably low number for comparisons of differences among the various sub-groups.

1.8.3 Survey Questionnaire

The PI questionnaire developed for this project was shaped by the following considerations:

- The **national education context** with respect to problems in the science and mathematics performance and achievement levels of pre-college students (as discussed in Section 1.1 above);
- The original **TEP program objectives** as established by the Congress, NSF, and the Education and Human Resources directorate (as discussed in Sections 2); and
- The **TEP program administration and operations** characteristics (as discussed in Section 3).
- The **evaluation objectives** for the study with respect to both past projects assessment and future program and policy decisions (as discussed in Sections 1 and 4 above).

The questionnaire sought to obtain information on a wide variety of evaluation topics so that the accomplishments of the TEP projects could be documented and various issues and problems that may have occurred could be identified and understood. A principal concern was that learning from this study be applicable to future policy, resource allocation, and program operations decisions regarding TEP.

Based upon a careful review of these various facets TEP, a series of questionnaire items were developed concerning:

- Program Goals;
- Principal Investigator characteristics;
- Factors influencing the selection of awardees;
- Goals and objectives of the individual projects;
- TEP project operations;
- Project funding support (NSF and other);
- Participant recruitment focus and procedures;
- General TEP project operations;
- Curricula Materials development; and
- Project outcomes and impacts.

More detailed information on the various topical areas included in the questionnaire appears in Figure 1.9.

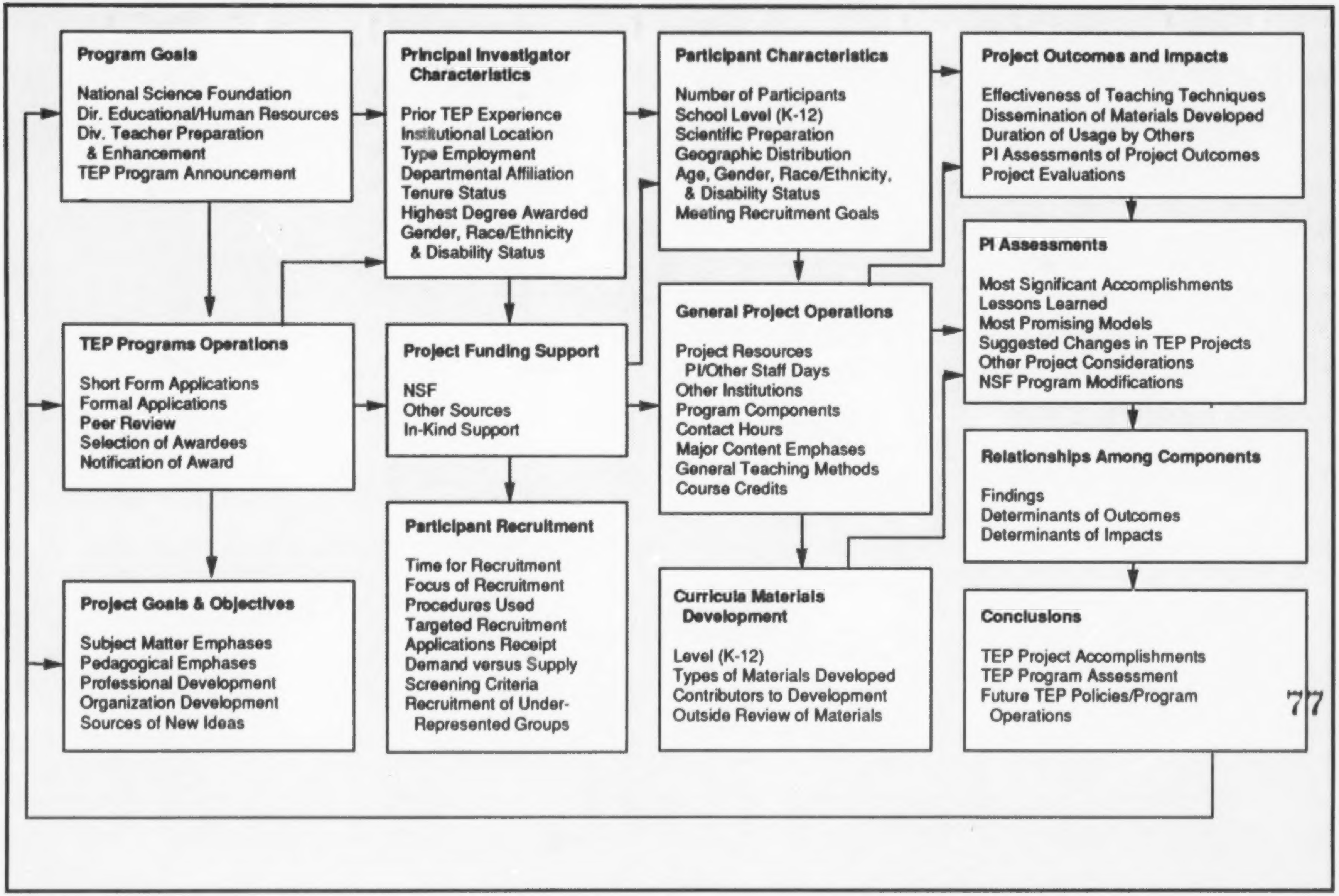
In addition to posing a series of structured questions regarding these various subjects, a series of open-ended questions were posed asking PIs to make observations in their own words. The open-ended questions concerned:

- the most significant accomplishments of the projects;
- important "lessons learned" from the projects that could be passed on to other Principal Investigators;
- any particular "models" for teacher enhancement projects that appear to have special promise;
- changes that PIs would make if they were going to do their projects over;
- any other general points they would like to make about their projects;
- suggestions to NSF regarding ways to improve the support provided to PIs; and
- suggestions to NSF on ways to improve its overall operation of the TEP program.

A copy of the PI Questionnaire is contained in Appendix B.

Figure 1.9

Analytic Logic for the Survey of Teacher Enhancement Program (TEP) Principal Investigators


Program Goals
National Science Foundation
Dir. Educational/Human Resources
Div. Teacher Preparation & Enhancement
TEP Program Announcement
Principal Investigator Characteristics
Prior TEP Experience
Institutional Location
Type Employment
Departmental Affiliation
Tenure Status
Highest Degree Awarded
Gender, Race/Ethnicity & Disability Status
Participant Characteristics
Number of Participants
School Level (K-12)
Scientific Preparation
Geographic Distribution
Age, Gender, Race/Ethnicity, & Disability Status
Meeting Recruitment Goals
Project Outcomes and Impacts
Effectiveness of Teaching Techniques
Dissemination of Materials Developed
Duration of Usage by Others
PI Assessments of Project Outcomes
Project Evaluations
PI Assessments
Most Significant Accomplishments
Lessons Learned
Most Promising Models
Suggested Changes in TEP Projects
Other Project Considerations
NSF Program Modifications
TEP Programs Operations
Short Form Applications
Formal Applications
Peer Review
Selection of Awardees
Notification of Award
Project Funding Support
NSF
Other Sources
In-Kind Support
General Project Operations
Project Resources
PI/Other Staff Days
Other Institutions
Program Components
Contact Hours
Major Content Emphases
General Teaching Methods
Course Credits
Relationships Among Components
Findings
Determinants of Outcomes
Determinants of Impacts
Participant Recruitment
Time for Recruitment
Focus of Recruitment
Procedures Used
Targeted Recruitment
Applications Receipt
Demand versus Supply
Screening Criteria
Recruitment of Under-Represented Groups
Project Goals & Objectives
Subject Matter Emphases
Pedagogical Emphases
Professional Development
Organization Development
Sources of New Ideas
Curricula Materials Development
Level (K-12)
Types of Materials Developed
Contributors to Development
Outside Review of Materials
Conclusions
TEP Project Accomplishments
TEP Program Assessment
Future TEP Policies/Program Operations

1.8.4 Response Rates

A response rate of 78 percent was attained in the survey of PIs. Appropriate weighting procedures were developed in order to generalize to the population.

1.8.5 Data Analyses

Similar analytic methods were applied to the PI data base as were used in the present study. Much of the logic that guided the analysis is suggested in Figure 1.8 above, wherein certain data may be considered as independent variables (pre-program and PI characteristics), others as program (or treatment) variables, and still others as dependent variables (where questions pertain to program assessment and outcomes).

Essentially, three types of analyses were performed. First, the distributions of responses for each item were determined. In the case of open-ended responses, special exhibits are provided to let the PIs "speak for themselves." Second, a series of relationships among the variables were examined (e.g., do differences in project outcomes arise as a function of size of award, specific goals and objectives of the projects, characteristics of the PIs, characteristics of the participants, participation in the TEP projects by other science organizations, and so forth). Finally, classification analyses are used to track various relationships among clusters of items (e.g., concerning participation by females, by minority groups, or differential effectiveness of mathematics and science methods and materials).

1.9 Organization of This Report

Chapters 2 through 9 examine, in order, the characteristics of the PIs and of the Participants, the recruitment experiences of participants the goals and objectives that they had for their projects, the approaches taken to recruitment of participants, the operation and administration of the projects (e.g., when the projects were operational -- summer and winter, successive years, the characteristics of the projects (e.g., subject matter, teaching methods), finally, the assessed outcomes and impacts of the projects. Chapter 10 examines relationships among these variables -- what is associated with what. Chapter 11 provides information on participants' and PIs' opinions and attitudes as expressed in their responses to the open-ended questions about their projects -- lessons learned, most effective project models, etc. The report concludes with conclusions and recommendations based upon the study findings.

PART ONE

CHARACTERISTICS OF THE TEACHER ENHANCEMENT PROJECTS AND THE PRINCIPAL INVESTIGATORS

2.0 THE TEP AWARDS AND PI CHARACTERISTICS

As an introduction to the survey of participants, Chapter Two provides information on the characteristics of the projects in which they participated, including the number of projects funded each year, the sources of funding support, and overall value of the project. Chapter Three then discusses various characteristics of the principal investigators. The data for these two chapters are actually drawn from a "sister" survey conducted of TEP PIs one year prior to the present survey.

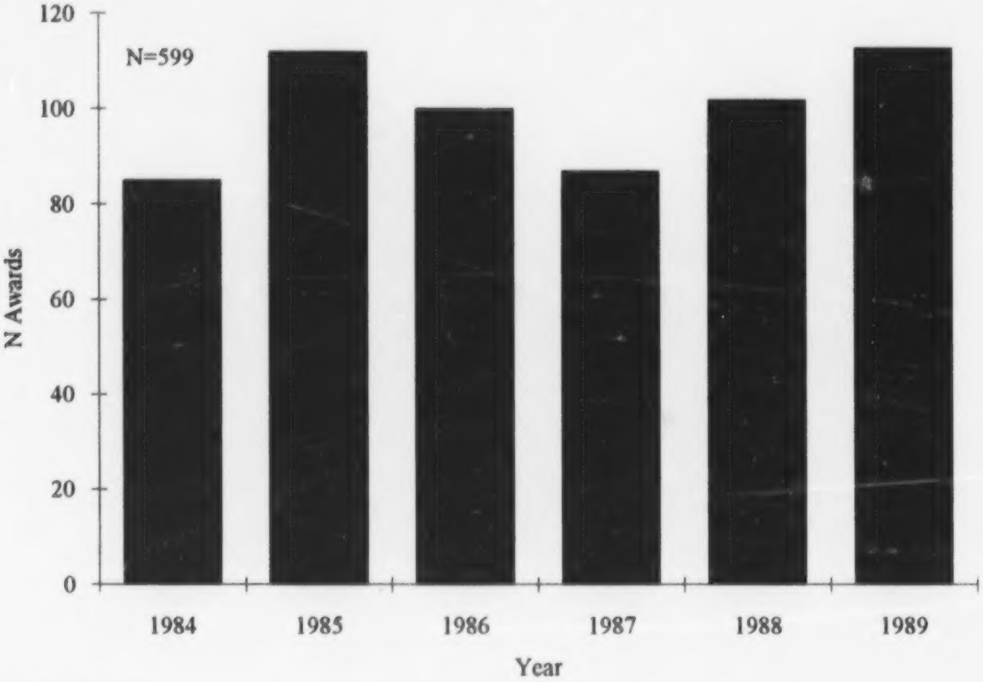
2.1 *The Number of Projects*

Between FY1984 and FY1989, NSF provided support to a total of 599 TEP projects, or an average of 100 new TEP projects each year. As seen in Figure 2.1, the number of grants awarded over this period was relatively stable, with the exception of the initial year and FY1987, when the numbers of new TEP awards were 85 and 87, respectively.

2.2 *NSF Funding*

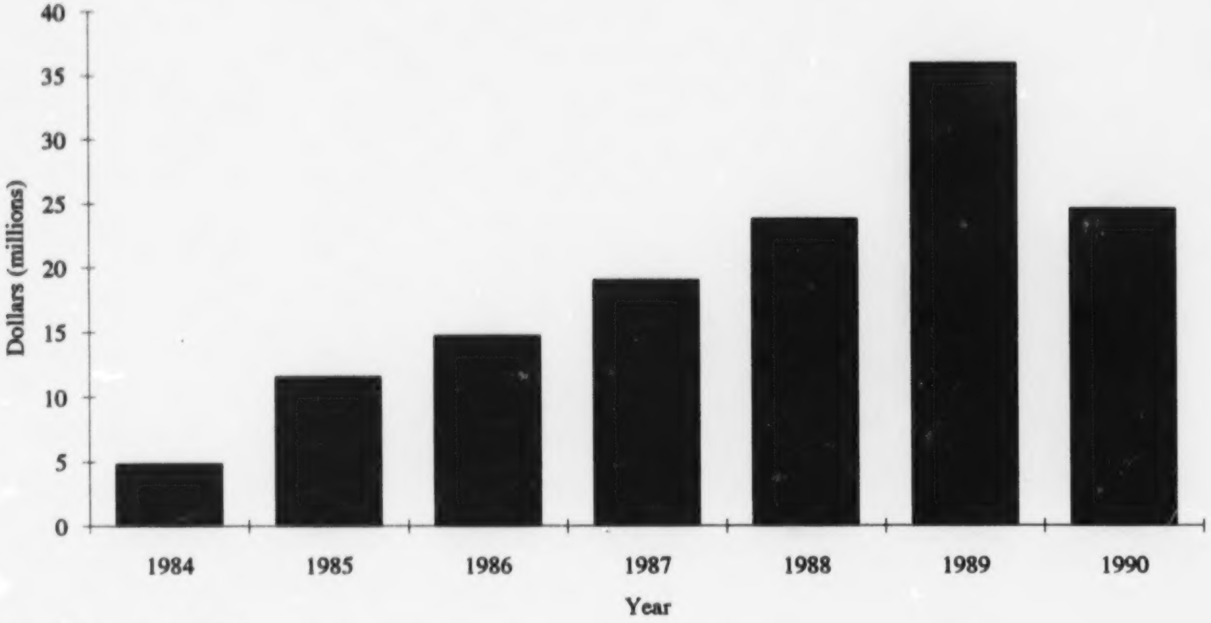
For the seven years, 1984 to 1990, the 599 TEP Projects are estimated to have expended a total of $134.7 million of their NSF funds on individual TEP project operations (see Figure 2.2A). Between 1984 and 1989, total annual TEP project expenditures increased steadily from $4.9 million to $36.0 million in 1989 (or a growth of 634%), and then declined to $24.6 million in 1990.

Figure 2.1 - Total Number of TEP Grants: FY1984-1989, by Award Cohort



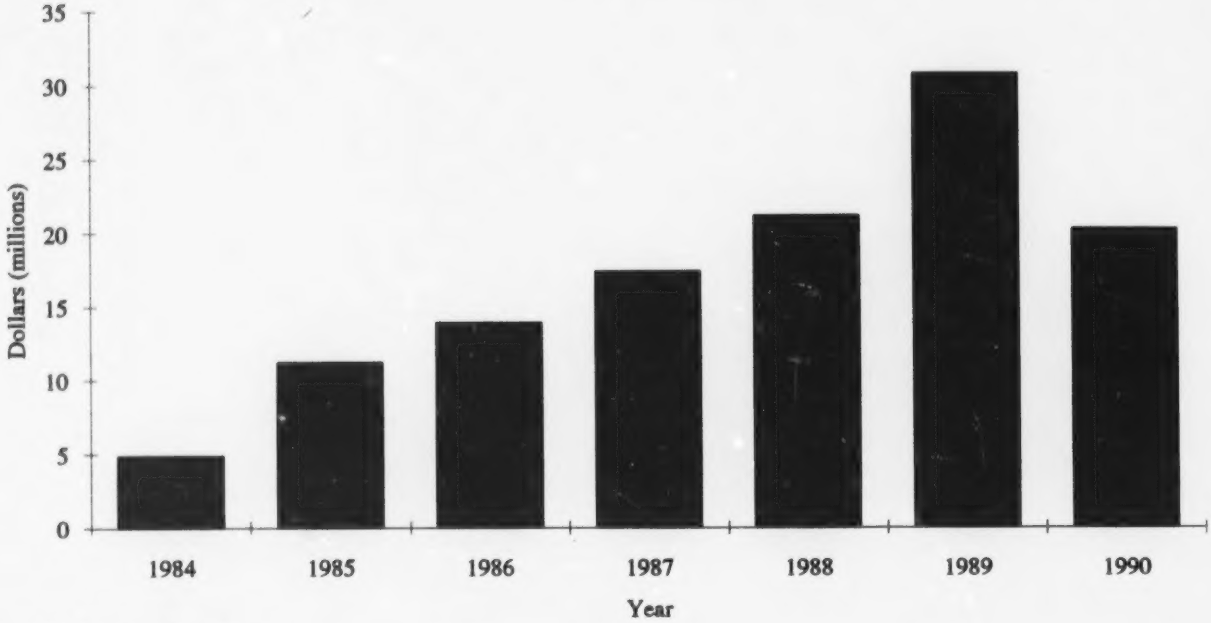
Source: NSF/TEP

Figure 2.2A - Total Current Dollar Value of TEP Grants, by Award Cohort



Source: PI Survey - Item 26

Figure 2.2B - Total Constant Dollar Value of TEP Grants, by Award Cohort



Source: PI Survey - Item 26

Using 1984 as the base year, expenditures between 1984 and 1990, measured in constant dollars, totaled $119.8 million.[1] As seen in Figure 2.2B, the total constant dollar value of NSF supported expenditures increased from $4.9 million in 1984 to $30.8 million in 1989 (or a growth of 523%).

As seen in Figure 2.3A, the median current dollar value of TEP per-project expenditures more than doubled between 1984 and 1990, increasing from $60,000 in 1984 to $128,627 in 1990 (or by 113%). When converted to 1984 constant dollars, as seen in Figure 2.3B, the data still reflect growth in expenditures, from about $60,000 in 1984 to $106,000 in 1990 (or by 76%).

2.3 Sources of Other Financial Support

TEP PIs were asked to identify sources of other financial support received by their projects. As shown in Figure 2.4, the most frequently reported sources of other support were the schools or districts of participating teachers (42.8%) and the PI's host institution (42.0%). Other sources of financial support cited by between 10 and 20 percent of PIs were private industry, foundations, participating teachers, and state government agencies. Over time, TEP PIs have received financial support from an increasing number of different sources, and the percentage of PIs reporting financial support from most other sources increased between 1984 and 1989. For example, the percentage of PIs who reported receiving financial support from the schools or districts of participating teachers increased from 29 percent in 1984 to 53 percent in 1989, and the percentage of PIs that reported receiving financial support from other sources increased from 60% in 1984 to 76% in 1989.

The estimated total dollar value of all financial contributions to TEP projects from other sources was $38.9 million in current dollars for the period 1984 to 1990. Over time, as seen in Figure 2.5A, the value of other financial contributions increased dramatically from $689,321 in 1984 to $10.1 million in 1989 (or by 1350%) before declining slightly to $8.4

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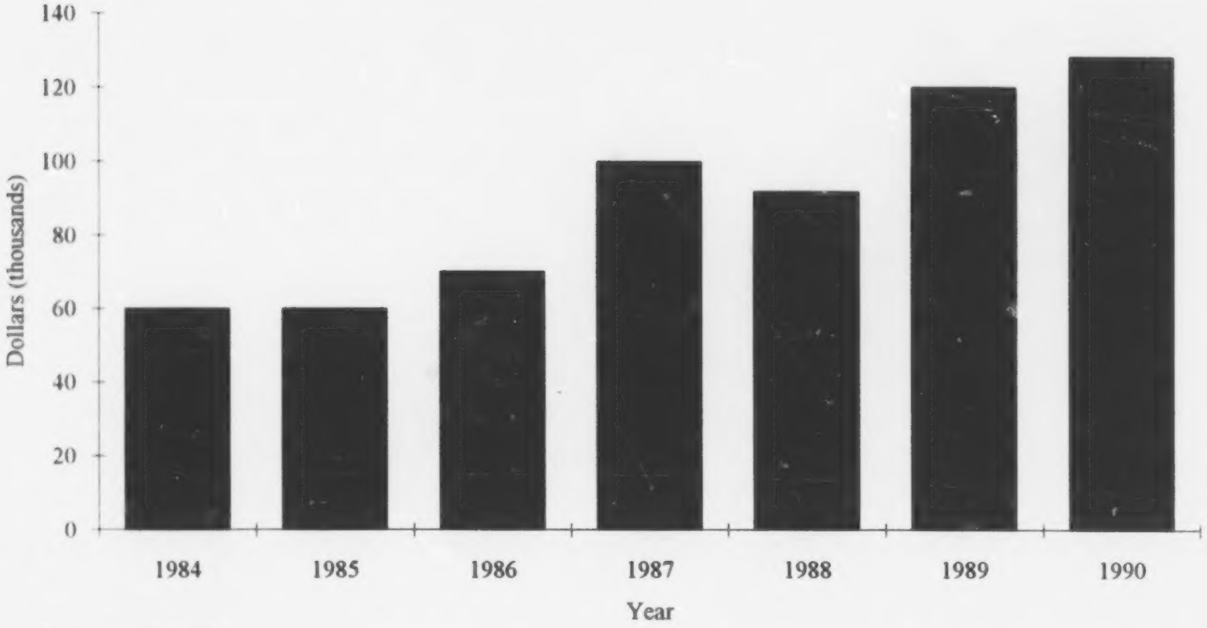
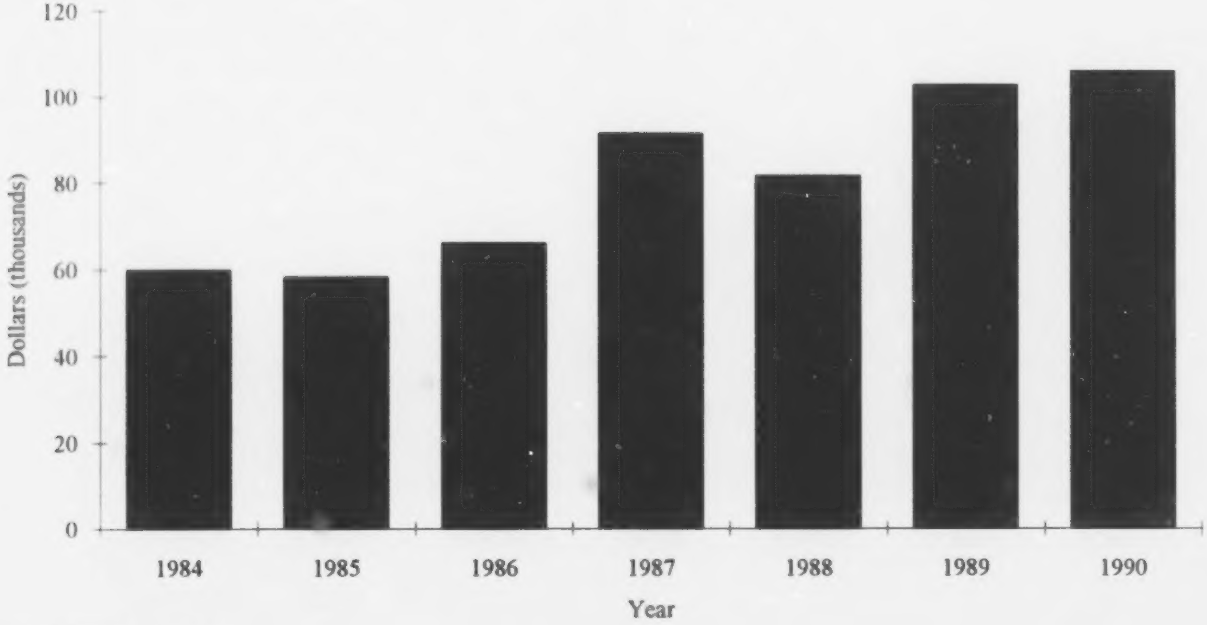
[1] *The National Science Foundation has traditionally used the GNP Price Deflator as a means of correcting for inflation; i.e. to show the relative growth or decline in dollars obligated to a particular program over time. The base year of calculation in this report is 1984. It should be noted that some economists and science policy analysts argue that the GNP Price Deflator may understate the extent of inflation in the R&D context. This would be the case where inflation in all goods and services was lower than inflation specifically in R&D related activities. Thus, these constant dollar values may be conservative estimates of the actual decline in purchasing power over time.*

Figure 2.3A - Median Current Dollar Value of TEP Grants, by Award Cohort



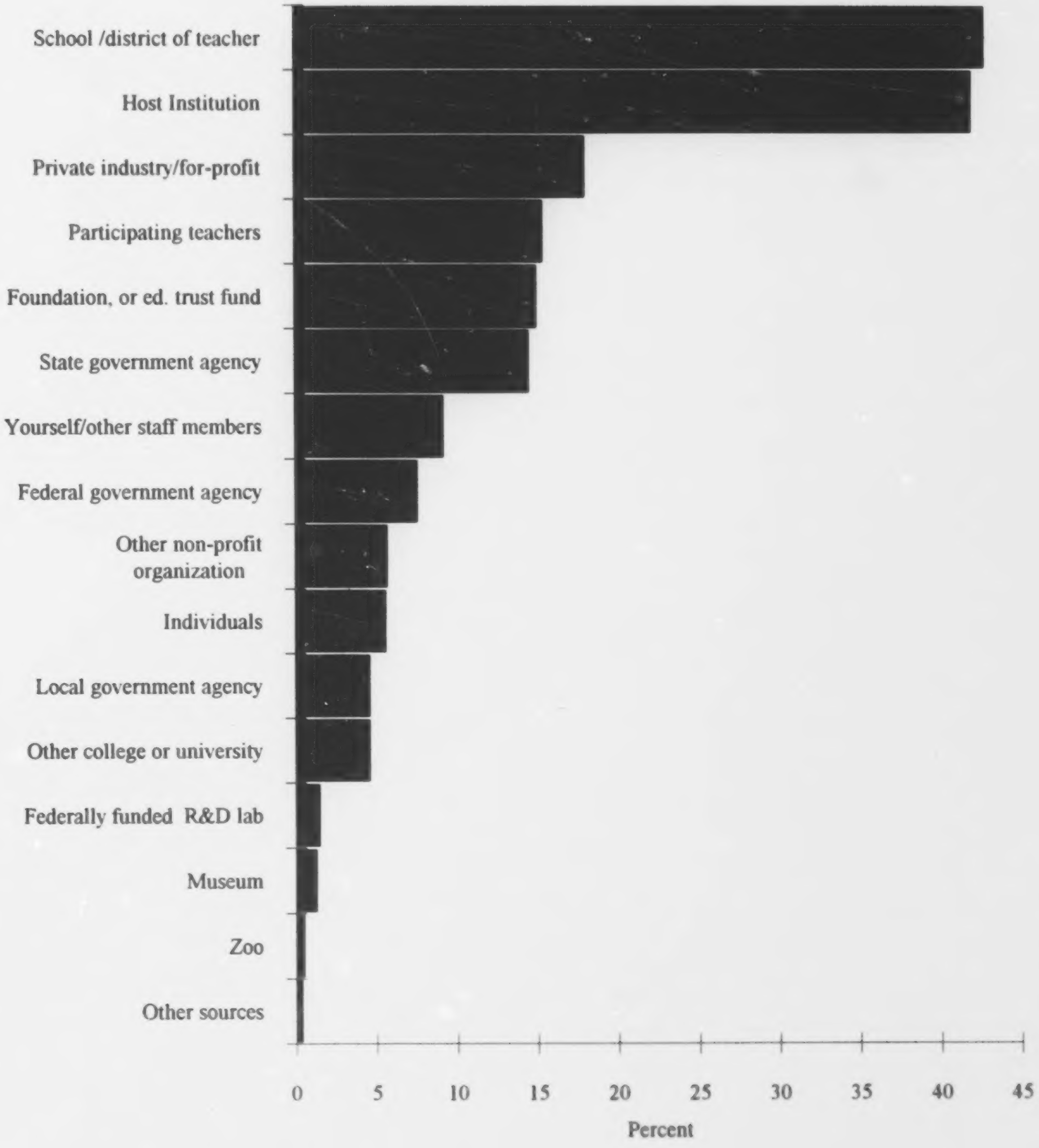
Source: PI Survey - Item 26

Figure 2.3B - Median Constant 1984 Dollar Value of TEP Grants, by Award Cohort



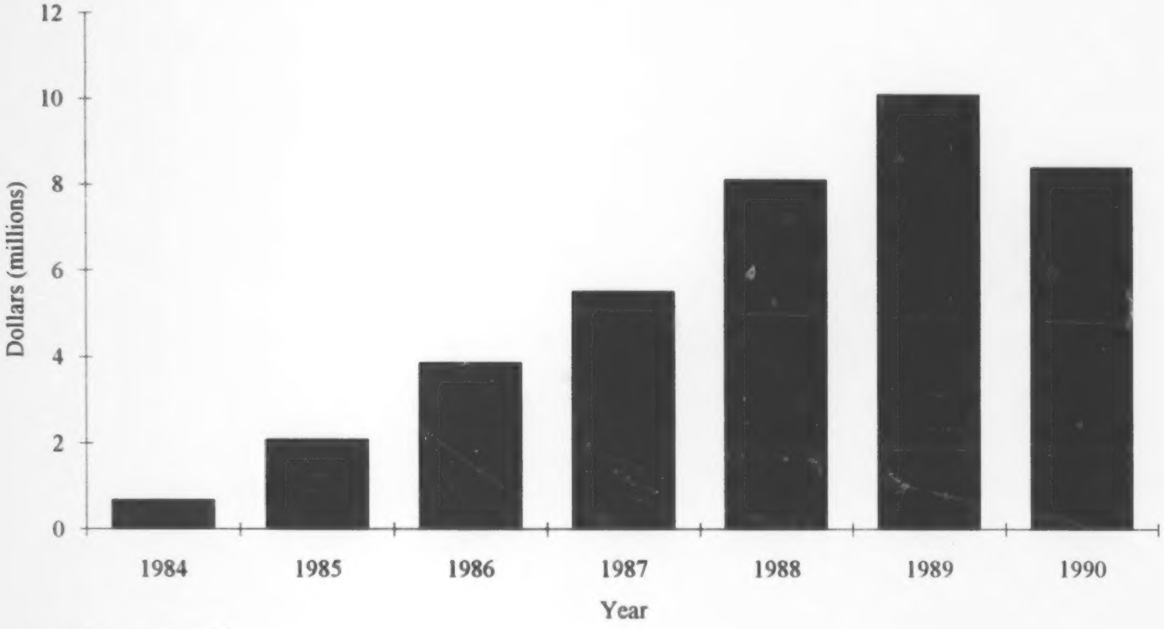
Source: PI Survey - Item 26

Figure 2.4 - Percent Reporting Other Sources of Financial Support to NSF Sponsored TEP Projects, by Type Source



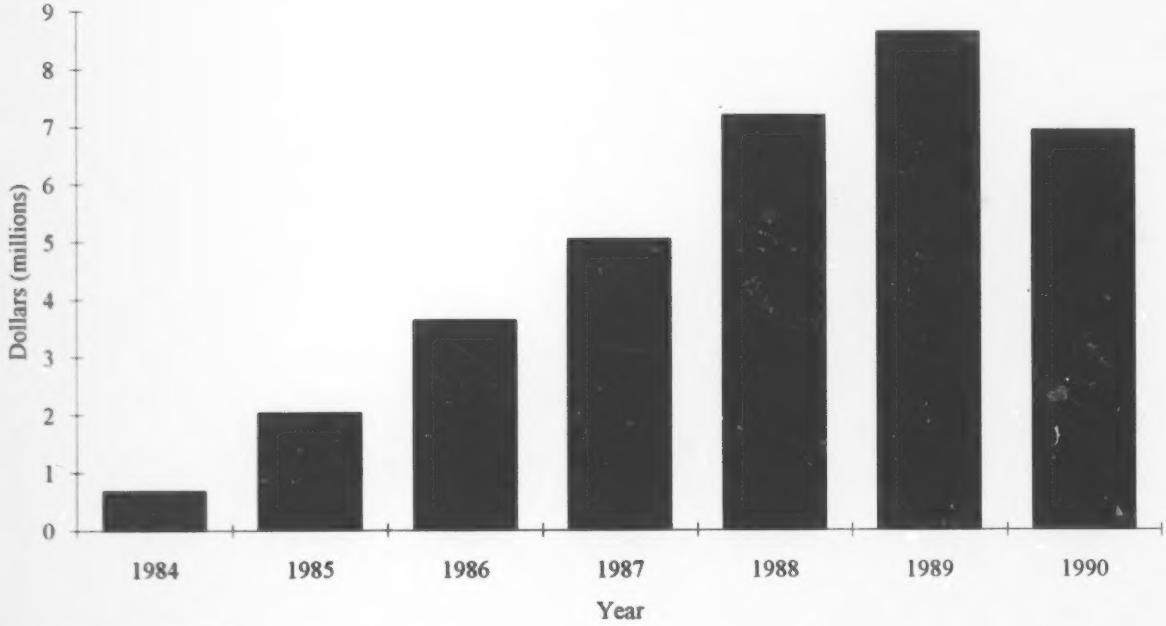
Source: PI Survey - Item 25

Figure 2.5A - Total Current Dollar Value of Financial Contributions to TEP Projects, by Award Cohort



Source: PI Survey - Item 26

Figure 2.5B - Total Constant 1984 Dollar Value of Financial Contributions to TEP Projects, by Award Cohort



Source: PI Survey - Item 26

million in 1990. In constant dollars, as seen in Figure 2.5B, the estimated total dollar value of all other financial contributions was $34.3 million, and their value rose from $689,321 in 1984 to $8.7 million in 1989 (or by 1,150%), before declining to $6.9 million annually in 1990.

As seen in Figure 2.6A, the median value of non-NSF financial support per TEP project increased from $12,000 in 1984 to $26,000 in 1990 (or by 116%). In 1984 constant dollars, as seen in Figure 2.6B, the median value of TEP projects rose from $12,000 in 1984 to $21,483 in 1990 (or by 79%).

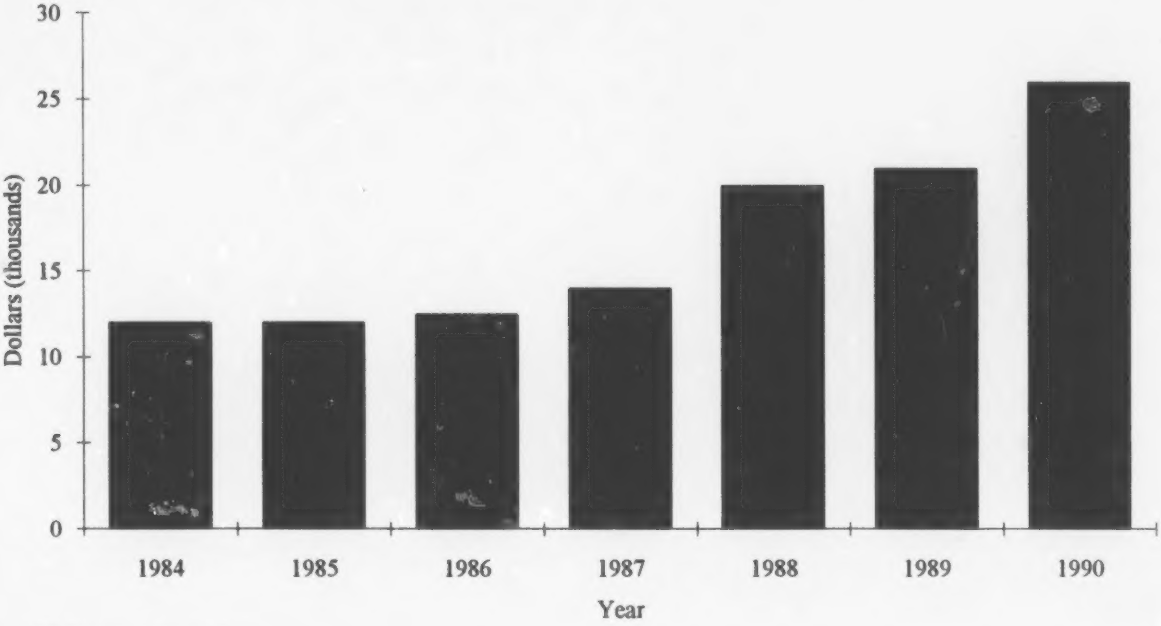
2.4 In-Kind Contributions

PIs were also asked to provide information on receipt of **in-kind support** from various other possible sources. As shown in Figure 2.7, the leading sources of other "in-kind" support were the PIs' host institution (82.3%), the schools or districts of participating teachers (46.3%), and the PI or other staff members (31.9%). The percentage of PIs who reported receiving in-kind contributions from the schools or districts of participating teachers increased from 19.4 percent in 1984 to 52.0 percent in 1989. The percentage of PIs reporting in-kind contributions from various other sources was also notably higher by 1989 with regard to colleges and universities (20.8%), museums (20.5%), and state government agencies (15.6%).

PIs were also asked to impute the worth of in-kind contributions (viz., donated labor, materials, and equipment). The total estimated dollar value of in-kind contributions was $32.9 million over the 1984 to 1990 period. Over time, as seen in Figure 2.8A, the value of these contributions (as estimated by the PIs) increased steadily from $1.2 million in 1984 to $8.5 million in 1989 (or an increase of 600%), before declining somewhat to $7.0 million in 1990. In 1984 constant dollars, as seen in Figure 2.8B, the estimated total dollar value of in-kind contributions was $29.1 million. In 1984, the value of in-kind contributions totaled $1.2 million, and grew to $7.9 million in 1989 (an increase of 558%) before declining to $5.8 million in 1990.

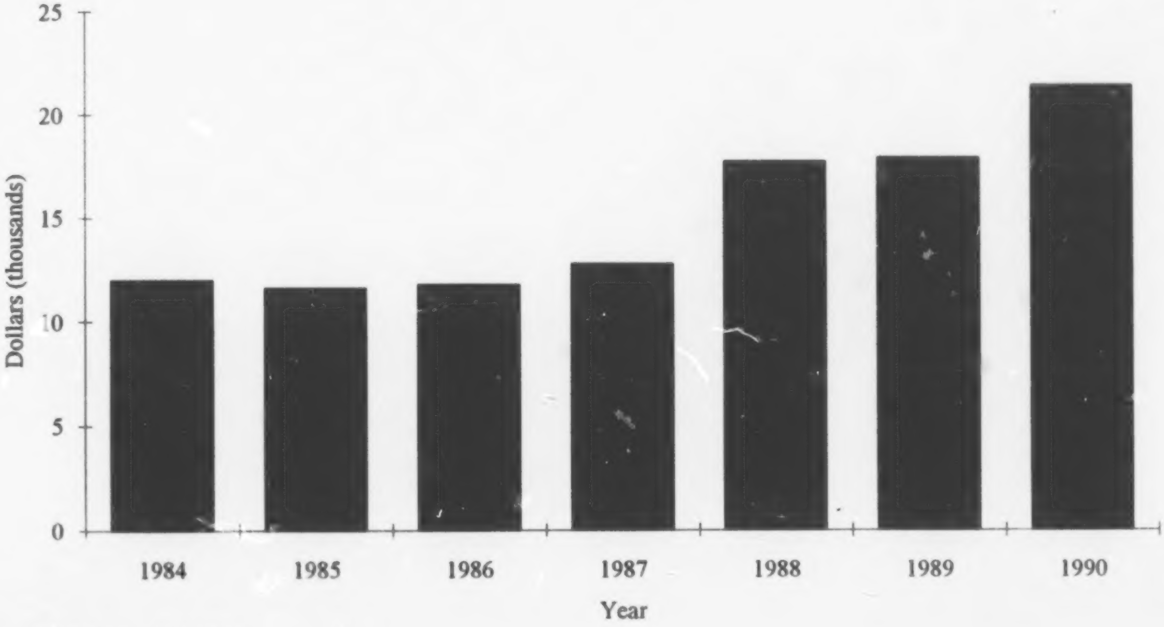
Over time, as seen in Figure 2.9A, the median annual value of in-kind contributions to individual TEP projects increased from $10,000 in 1984 to $20,000 in 1990 (or by 100%). In 1984 constant dollars, as seen in Figure 2.9B, the median value of in-kind contributions increased from $10,000 in 1984 to $17,115 in 1989 (or by 71%).

Figure 2.6A - Current Median Dollar Value of Financial Contributions to TEP Projects, by Award Cohort



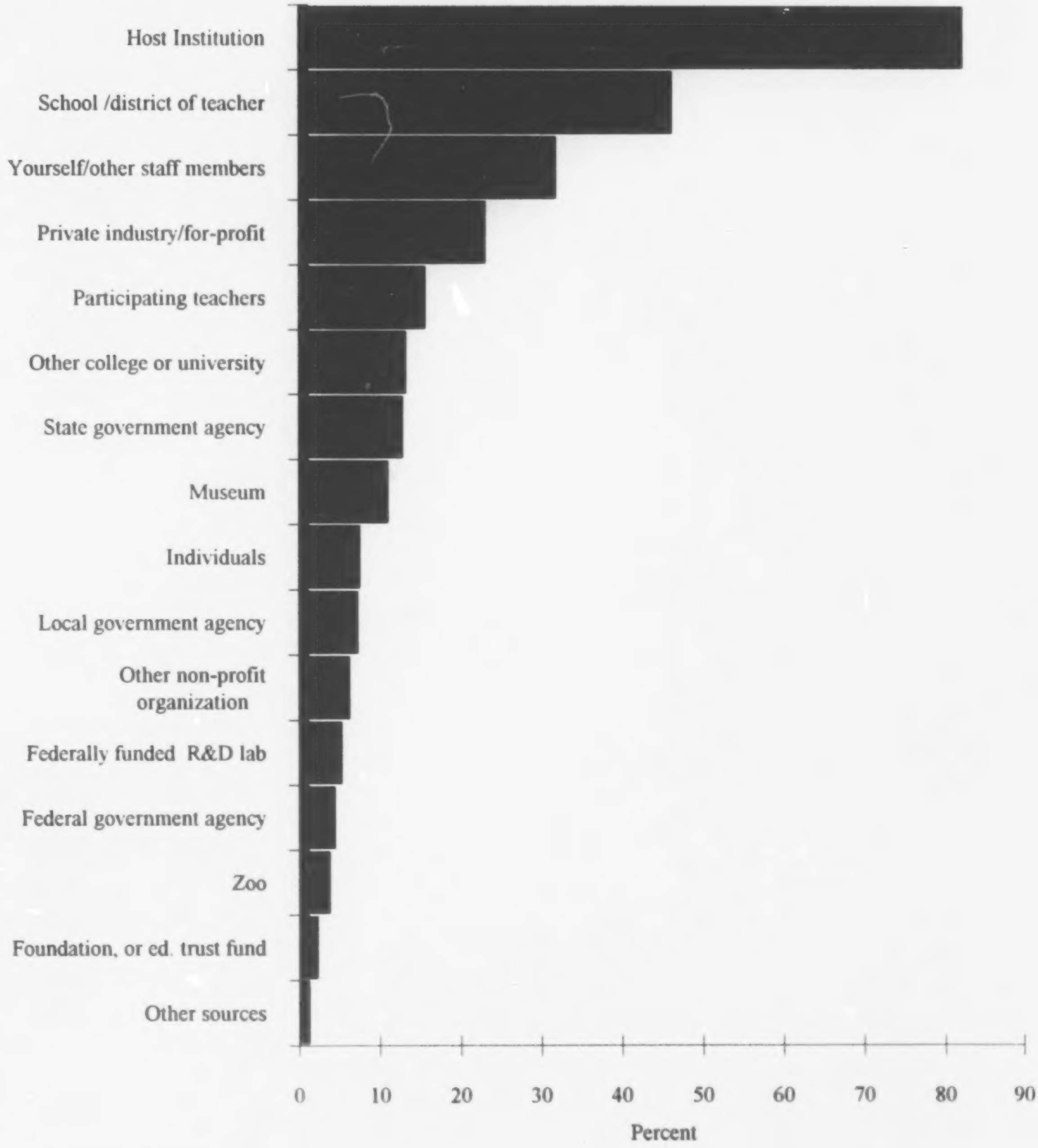
Source: PI Survey - Item 26

Figure 2.6B - Constant 1984 Median Dollar Value of Financial Contributions to TEP Projects, by Award Cohort



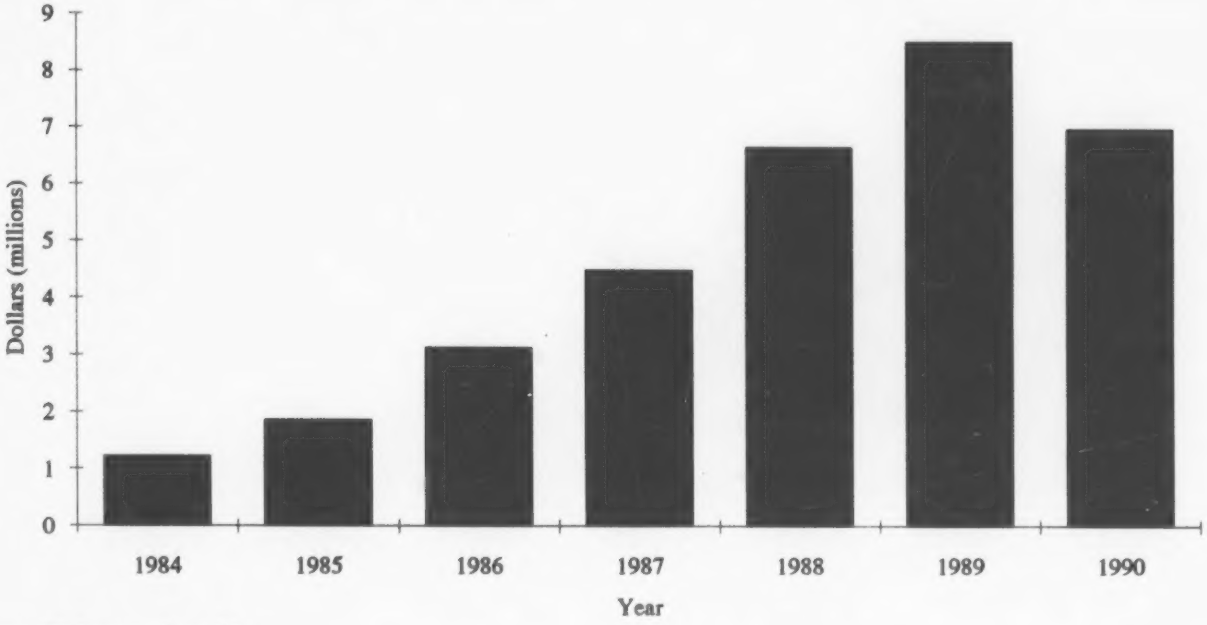
Source: PI Survey - Item 26

Figure 2.7 - Percent Reporting Other Sources of In-Kind Support to NSF Sponsored TEP Projects, by Type Source



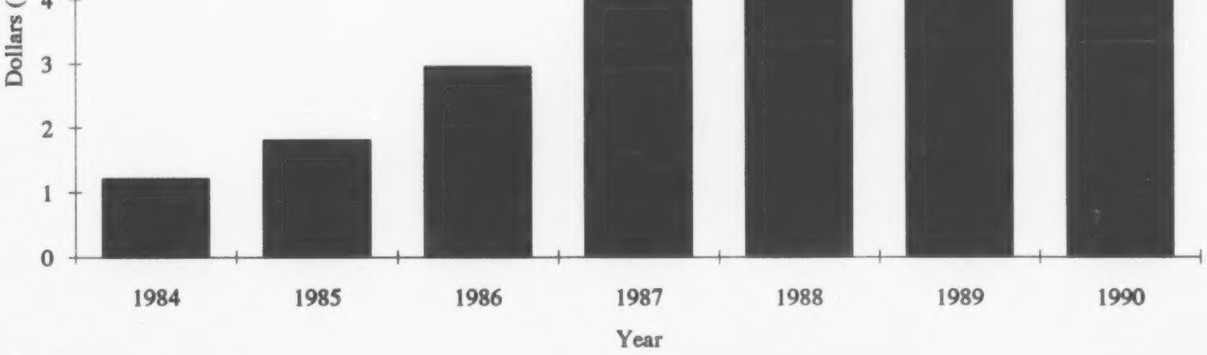
Source: PI Survey - Item 25

Figure 2.8A - Estimated Total Current Dollar Value of In-Kind Contributions to TEP Projects, by Award Cohort



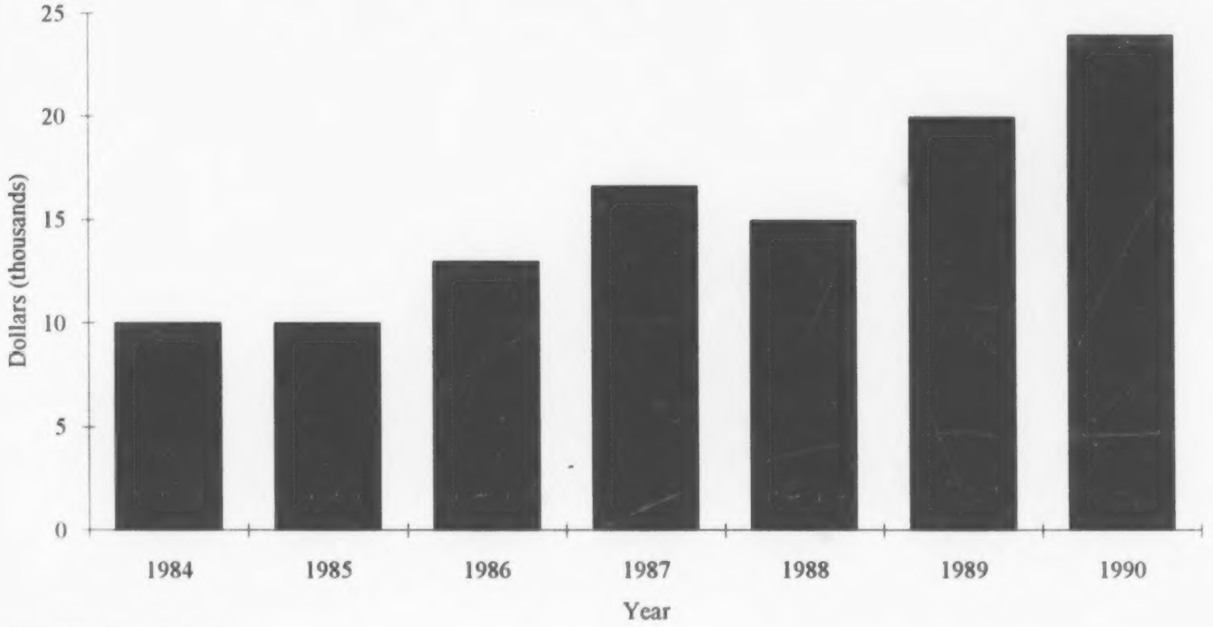
Source: PI Survey - Item 26

Figure 2.8B - Estimated Total Constant Dollar Value of In-Kind Contributions to TEP Projects, by Award Cohort



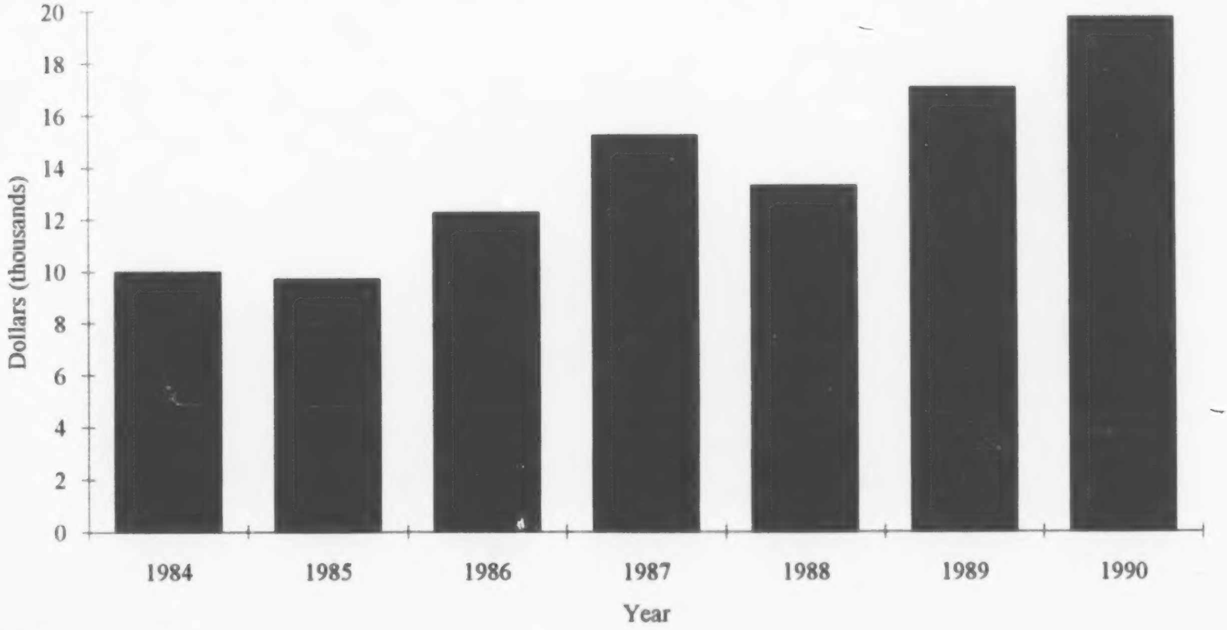
Source: PI Survey - Item 26

Figure 2.9A - Median Current Dollar Value of In-Kind Contributions to TEP Projects Receiving In-Kind Contributions, by Award Cohort



Source: PI Survey - Item 26

Figure 2.9B - Median Constant 1984 Dollar Value of In-Kind Contributions to TEP Projects Receiving In-Kind Contributions, by Award Cohort



Source: PI Survey - Item 26

2.5 Total Value of TEP Projects

Combining the dollar value of the NSF supported expenditures with both financial and in-kind contributions from all sources provides answers to three questions. First, what was the aggregate expenditure for all TEP projects? Second, what was the extent of leverage attained by NSF by virtue of these additional dollars? Third, did these values change over time. Summarizing the data on TEP project expenditures across all years reveals the following:

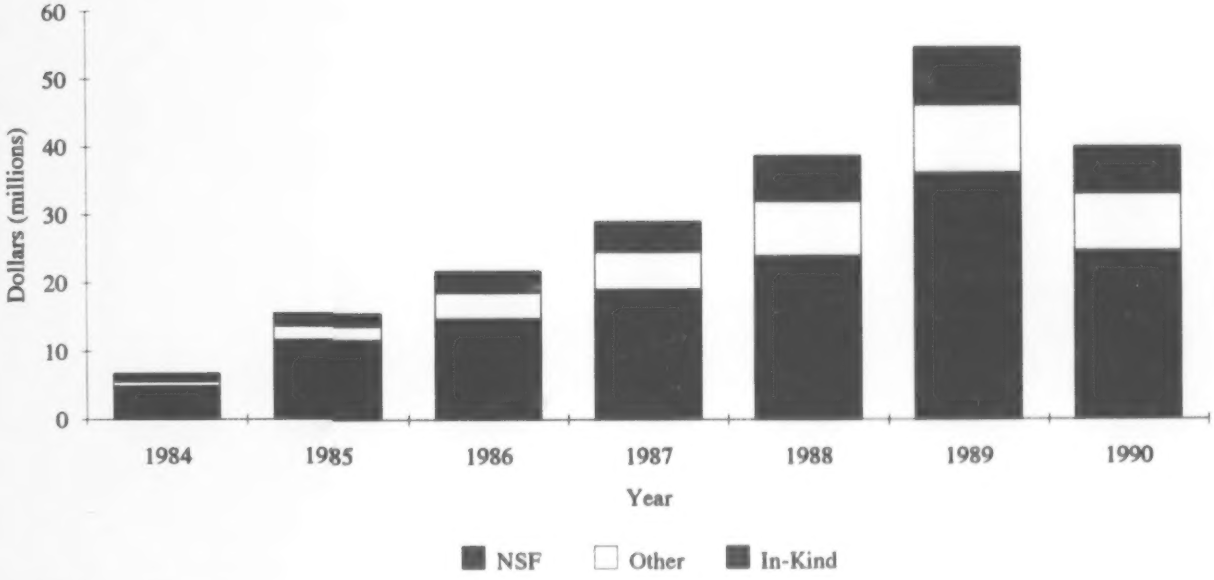
	Current$(m)	**% Total**	**Constant$(m)**	**% Total**	**%Leverage**
NSF	$134.7	65.3%	$119.8	65.4%	100.0%
OTHER	38.9	18.8%	34.3	18.7%	28.6%
IN-KIND	32.9	15.9%	29.1	15.9%	24.3%
TOTAL	$206.4	100.0%	$183.2	100.0%	152.9%

Stated in other terms, for every $100,000 of expenditures supported by NSF dollars, $28,600 in financial support was added by other sources while an imputed $24,300 was added through in-kind contributions. Bringing these three values together, for every $100,000 in NSF obligations expended, a total of $52,900 in expenditures from other sources was added, for a leverage of roughly 53 percent.

The estimated total expenditure in current dollars was $206.4 million for all years; total expenditures have increased notably over time. In 1984, as seen in Figure 2.10A, TEP project expenditures totaled $6.8 million, over the next five years this amount grew almost eightfold to $54.7 million in 1989 (an increase of 804%). (In 1990, expenditures of all TEP projects receded somewhat to $40 million.) The relative proportion of expenditures from all sources appears in Figure 2.3; as may be seen, non-NSF contributions accounted for roughly one-third of total annual expenditures over time.

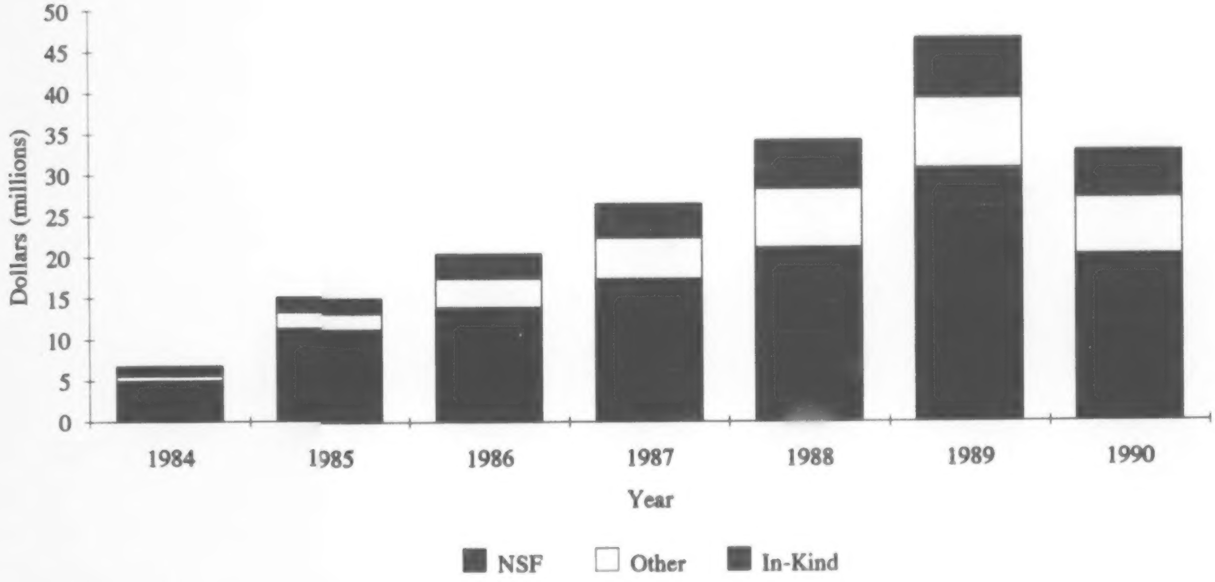
As seen in Figure 2.10B, estimated total expenditures in 1984 constant dollars was $183.2 million. In 1984, expenditures totaled $16.7 million and increased to $46.8 million in 1989 (or by 598%). (In 1990, total expenditures declined to $33.1 million.)

Figure 2.10A - Total Current Dollar Value of TEP Projects: NSF Support, Other Support, and Imputed Dollar Value of In-Kind Support, by Award Cohort



Source: PI Survey - Item 26

Figure 2.10B - Total Constant 1984 Dollar Value of TEP Projects: NSF Support, Other Support, and Imputed Dollar Value of In-Kind Support, by Award Cohort

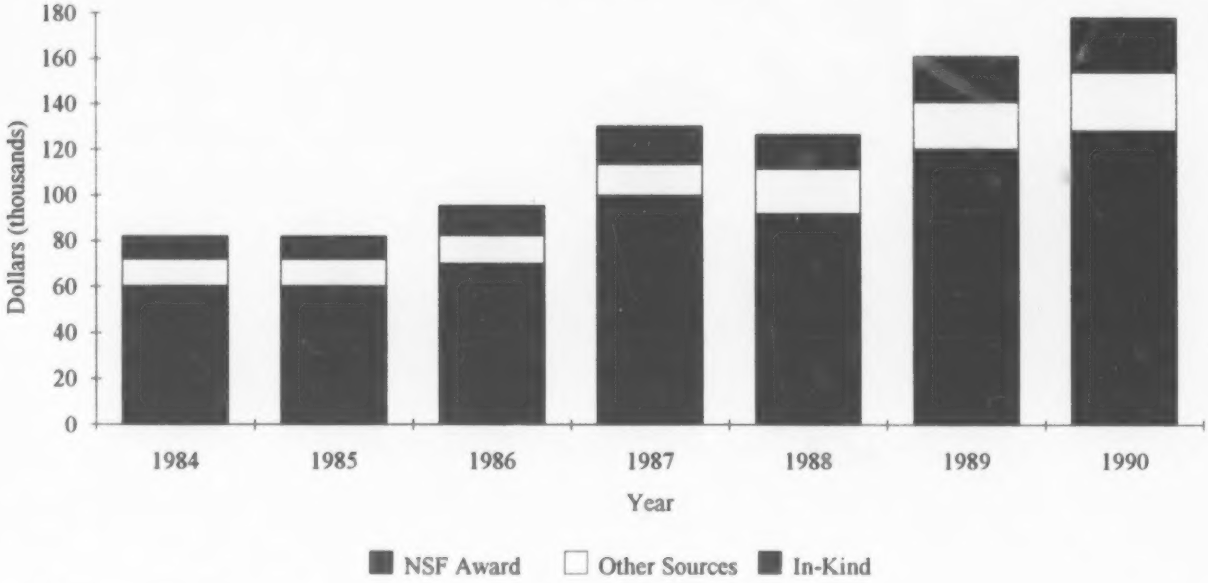


Source: PI Survey - Item 26

The estimated median expenditures of individual TEP projects rose notably over time, as seen in Figure 2.11A. They almost doubled over six years, from $82,000 in 1984 to $161,388 in 1989 (a gain of 97%). Especially large gains were made in 1987 (an increase of $35,000 over the previous year), and 1989 (an increase of over $35,000 over the previous year).

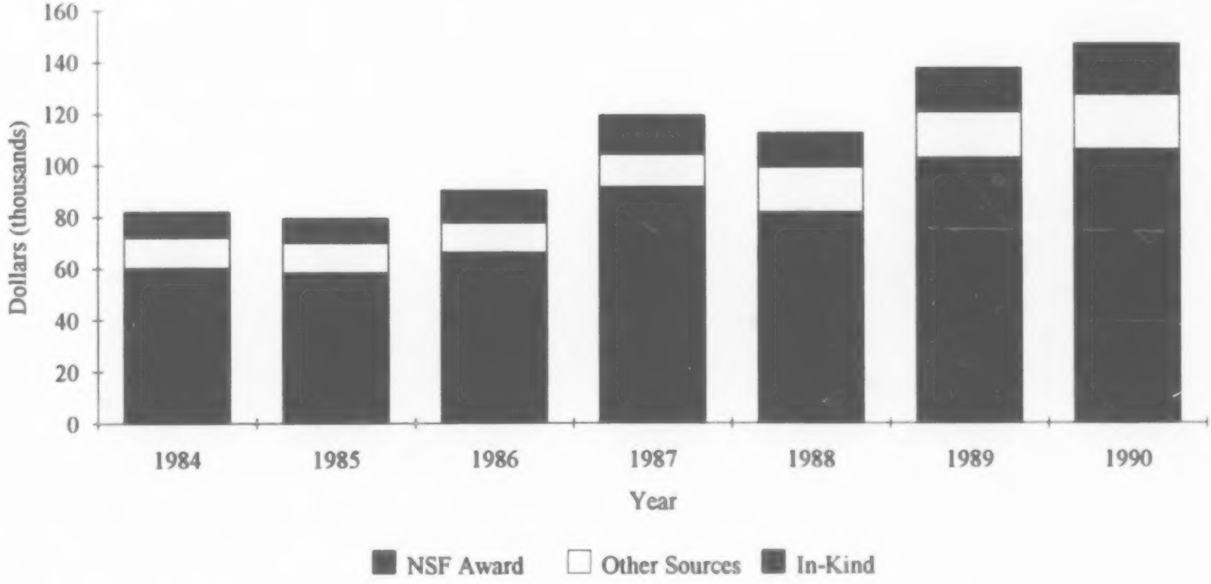
As seen in Figure 2.11B, the estimated constant dollars expenditures of individual TEP projects increased from $82,000 in 1984 to $138,065 in 1989 (or an increase of 68%). The median total project expenditures in 1990 continued to increase to $147,596.

Figure 2.11A - Median Current Dollar Value of TEP Projects: NSF Support, Other Support, and Imputed Dollar Value of In-Kind Support, by Award Cohort



Source: PI Survey - Item 26

Figure 2.11B - Median Constant 1984 Dollar Value of TEP Projects: NSF Support, Other Support, and Imputed Dollar Value of In-Kind Support, by Award Cohort



Source: PI Survey - Item 26

3.0 CHARACTERISTICS OF PRINCIPAL INVESTIGATORS

Data from the earlier survey of Principal Investigators, concerning their prior inservice training experience, their institutional location and departmental affiliation, and various other characteristics, provide further additional context on those TEP projects which participants evaluated.

NSF maintains records on all awards in terms of type of institution of the PI. As indicated in Chapter 1.0, according to NSF data, more than 80 percent of the PIs were located at public and private institutions of higher education, 13 percent at non-profit, non-academic institutions, and most of the remaining at locally controlled, public academic institutions.

3.1 PI Characteristics

3.1.1 Type of Employment

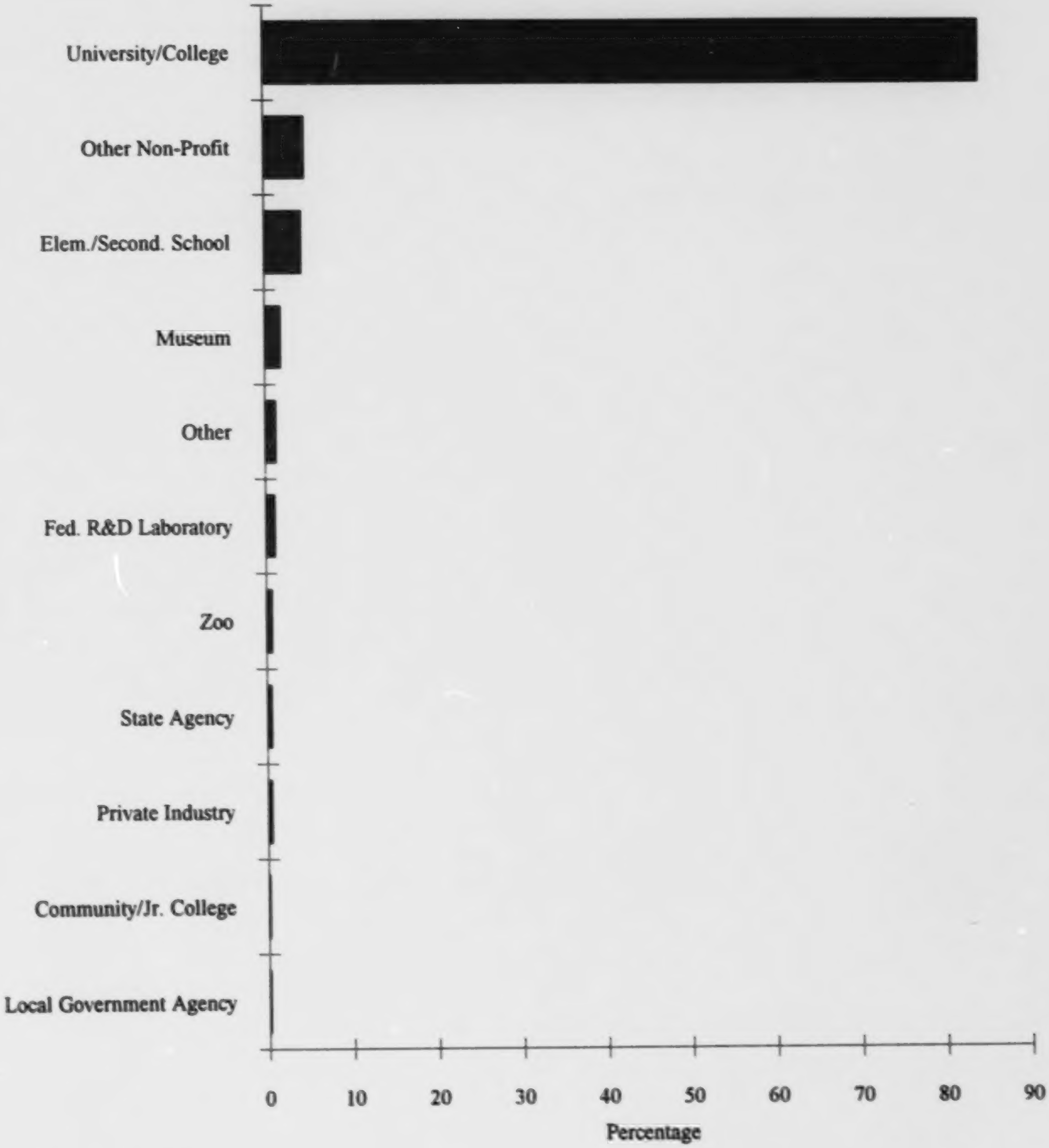
The large majority of PIs (84.4%), as seen in Figure 3.1, reported being employed by universities or four-year colleges. The remainder of the PIs were employed by non-profit organizations (4.8%), public or private elementary or secondary schools (4.4%); no other category employed more than two percent of the PIs.

Over time, the percentage of PIs employed by universities has declined steadily. In 1984, over 95 percent of all PIs were employed by universities, but by 1989 this level was 78.8 percent. By contrast, the percentage of PIs employed by non-profit organizations has steadily increased; in 1984, only 1.6 percent of PIs were employed by non-profit organizations (e.g., museums, zoos), while by 1989 this percentage had increased to 7.7 percent.

3.1.2 Departmental Affiliation

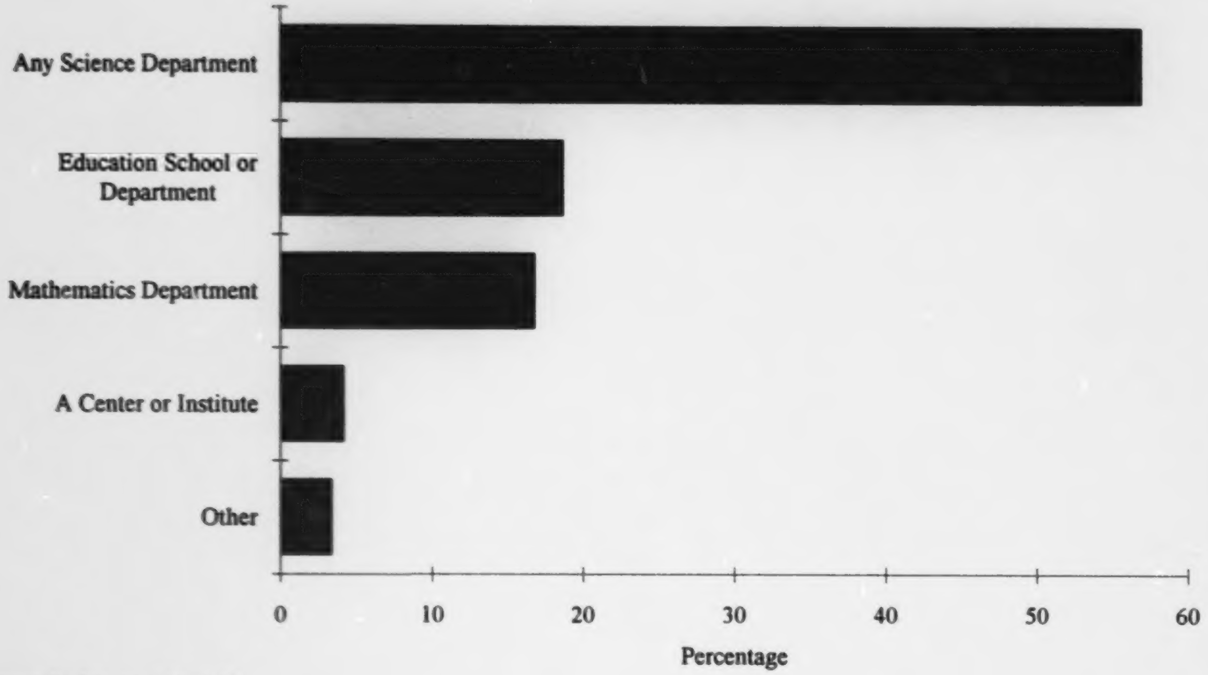
For those PIs employed by universities, as seen in Figure 3.2, the most typical departmental affiliation was with a university science department (56.9%). University-employed PIs were also affiliated with education schools or departments (18.7%) and mathematics departments (16.8%).

Figure 3.1 - Institutional Location of Awardees



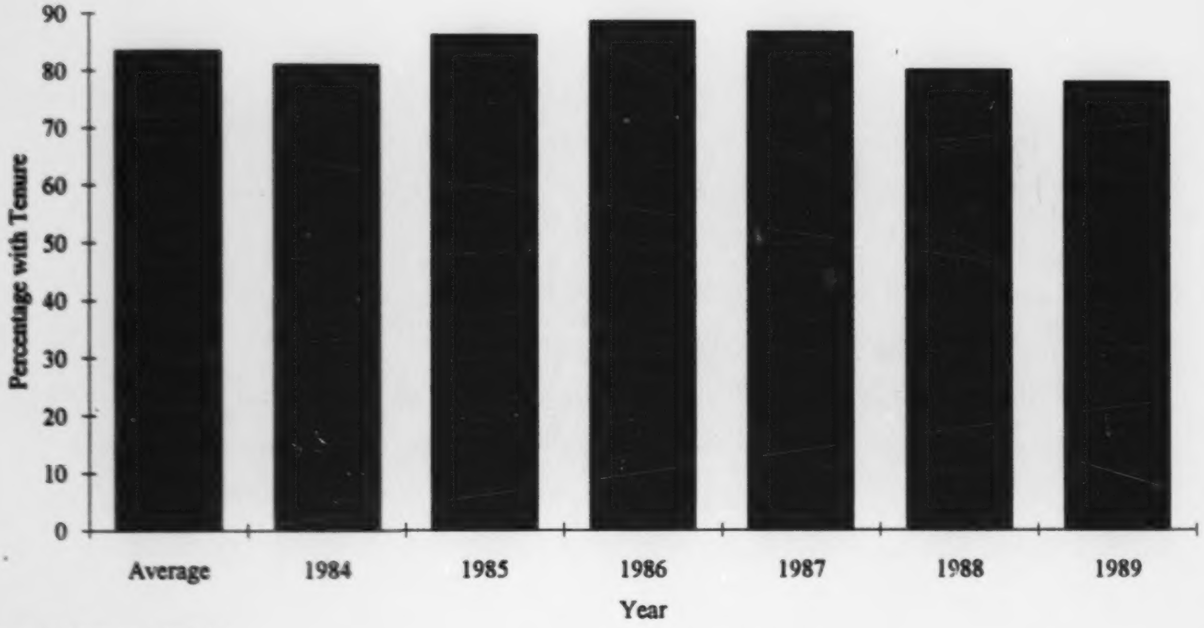
Source: PI Survey - Item 27

Figure 3.2 - Departmental Affiliation of Awardees



Source: PI Survey - Item 28

Figure 3.3 - Tenure Status of University Awardees at Time of TEP Award, by Award Cohort



Source: PI Survey - Item 29

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Over time, the percentage of university-employed PIs affiliated with science departments has decreased, and the percentage of PIs affiliated with education schools or departments and mathematics departments has risen. Whereas in 1984 almost 70 percent of all university-employed PIs were affiliated with science departments, by 1989 this level dropped to 44.5 percent. PIs affiliated with education schools and departments comprised only 10.2 percent of all PIs in 1984, but by 1989, this level had increased to 22.7 percent. The percentage of PIs affiliated with mathematics departments increased from 13.6 percent to 18.7 percent during the same time period.

3.1.3 Tenure Status

Among those PIs employed by a university, as seen in Figure 3.3, 83.5 percent had received tenure at their college or university prior to the time of the award. The proportion of tenured PIs remained relatively constant over time, peaking at 88.7 percent in 1986, and declining to 78.3 percent in 1989.

3.1.4 Highest Degree Awarded

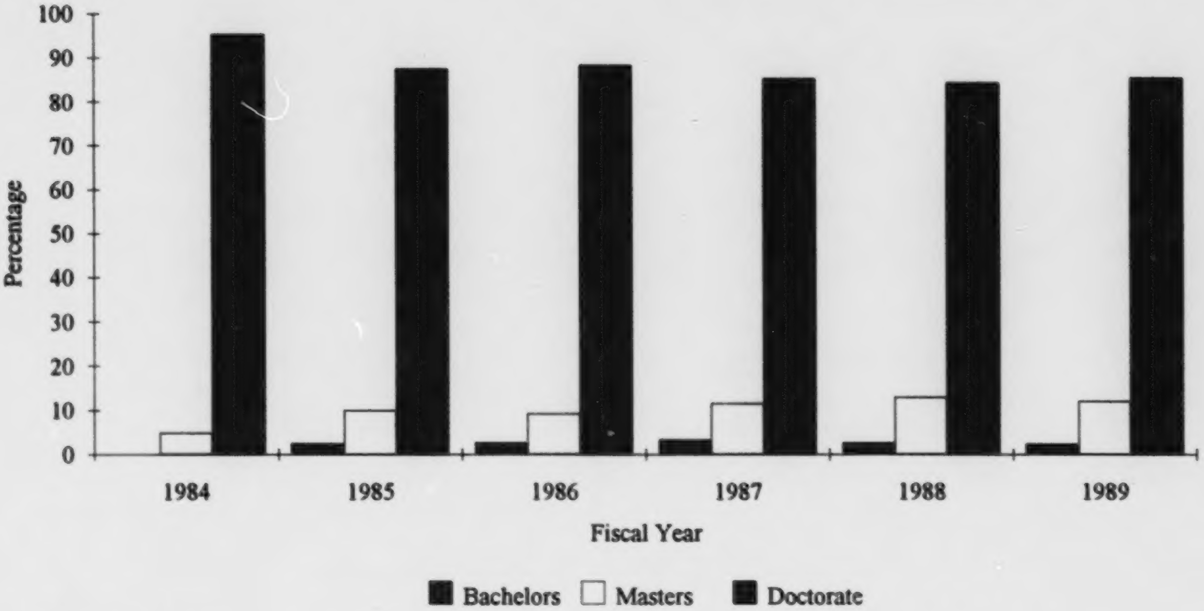
As seen in Figure 3.4, a large proportion (87.5%) of all PIs have received doctoral degrees, 10.2 percent of all PIs held a Master's degree as their highest level of degree earned, and 2.3 percent held Bachelor's degrees. Over time, the percentage of PIs holding doctoral degrees ranged from a low of 84.4 percent of all PIs in 1988 to a high of 95.2 percent in 1984.

3.1.5 Disciplinary Background

The largest percentage of PIs (19.0%) reported having a degree in science education (see Figure 3.5). Other common disciplinary backgrounds for PIs included physics (14.6%), the biological sciences (13.8%), chemistry (11.8%), mathematical sciences (10.3%), and mathematics education (9.3%). Oceanography, astronomy, and the social sciences were the least frequently reported disciplines among PIs.

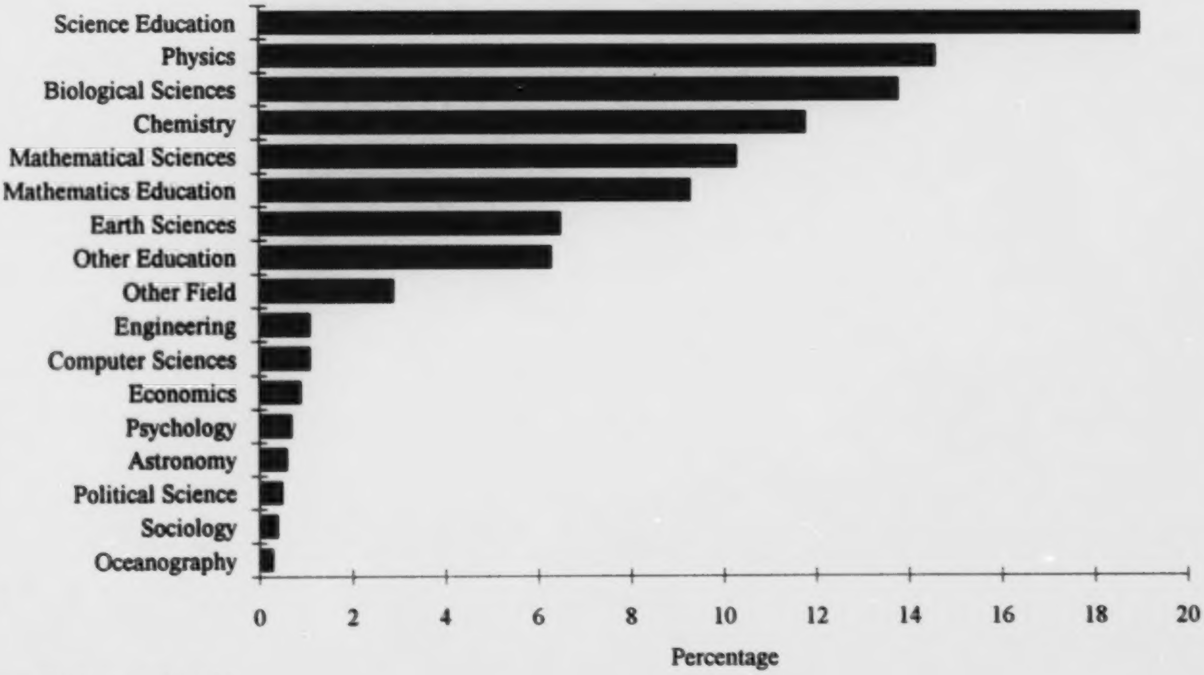
The percentage of PIs with backgrounds in the mathematical sciences has increased more than twofold over time -- from a low of 4.8 percent in 1984 to 13.0 percent in 1989. This increase, and a small decrease in the percentage of PIs with backgrounds in the biological, chemical, and physical sciences, has narrowed somewhat the gap between PIs with mathematical backgrounds and those trained in the other scientific disciplines.

Figure 3.4 - Highest Degree Awarded at Time of Award, by Cohort Year



Source: PI Survey - Item 31

Figure 3.5 - Discipline of Awardees' Highest Degree



Source: PI Survey - Item 32

3.2 Personal Characteristics of PIs

3.2.1 Age at Time of Award

Clearly, as seen in Figure 3.6A, more senior scientists, mathematicians, and educators are serving as PIs -- with 87 percent being 40 years of age or older. The median age of all PIs is 47 years, and the largest segment of PIs (47.1%) is between 40 and 49 years old. The second largest segment is the 50-59 year age category, which includes 31.9 percent of all PIs. The youngest age group included participants 30-39 years old; this group accounted for 12.4 percent. The smallest age segment is the 60 years and older bracket which accounts for 8.5 percent of all PIs.

Viewed over time, as seen in Figure 3.6B, the average age of the typical PI increased between 1984 and 1989. In 1984 the median age of all PIs was 46 years old, in 1989 it was 49 years. The percentage of PIs between 30 and 39 years of age declined steadily from 21.0 percent in 1984 to only 3.6 percent in 1989. In contrast, the percentage of PIs over age 60 increased from 6.5 percent in 1984 to 12.8 percent in 1989. The percentage of PIs between 50 and 59 years old also increased during this period, from 22.6 percent in 1984 to 35.7 percent in 1989.

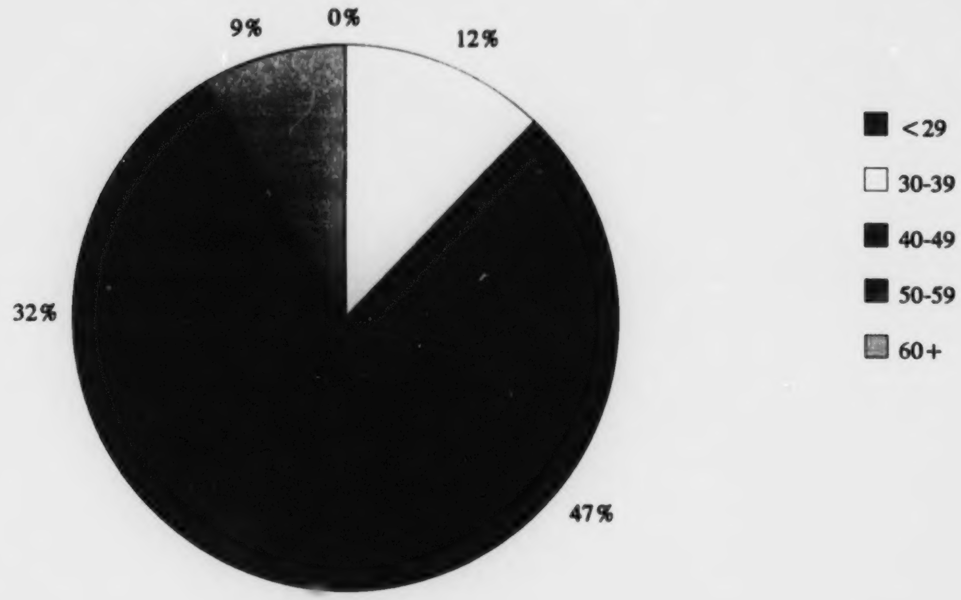
3.2.2 Gender

NSF encourages women to apply for grants. Of all TEP project awardees, as seen in Figure 3.7A, 22.6 percent were women. Over time the percentage of female Principal Investigators has slowly increased -- from 19.4 percent of PIs in 1984, to 26.1 percent in 1989 (see Figure 3.7B).

3.2.3 Race and Ethnicity

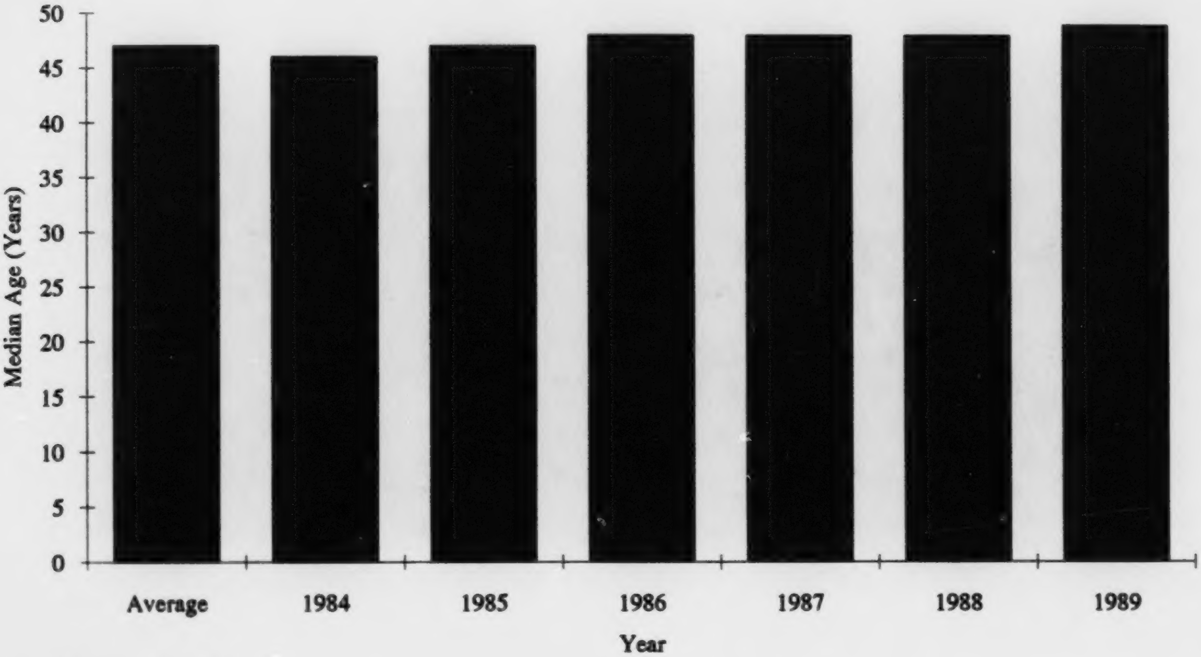
NSF also encourages minorities to apply for grants. As seen in Figure 3.8A, the majority of TEP PIs (94.4%) were White (and not of Hispanic origin). Blacks (not of Hispanic origin) accounted for 2.4 percent of all PIs while Asian or Pacific Islanders, Native Americans or Alaskan Natives, and Hispanics each accounted for less than 1.5 percent of all Principal Investigators.

Figure 3.6A - Age At Time of TEP Award



Source: PI Survey - Item 36

Figure 3.6B - Average Age at Time of TEP Award, by Award Cohort



Source: PI Survey - Item 36

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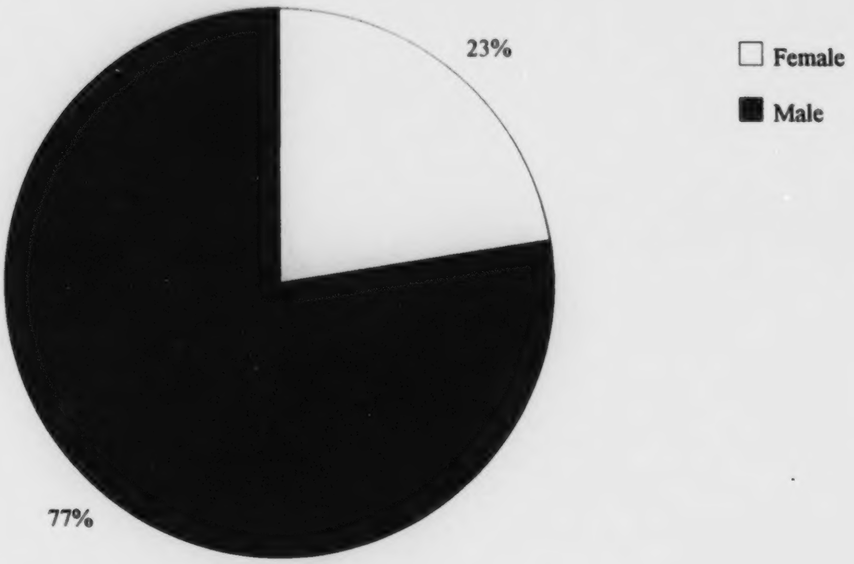
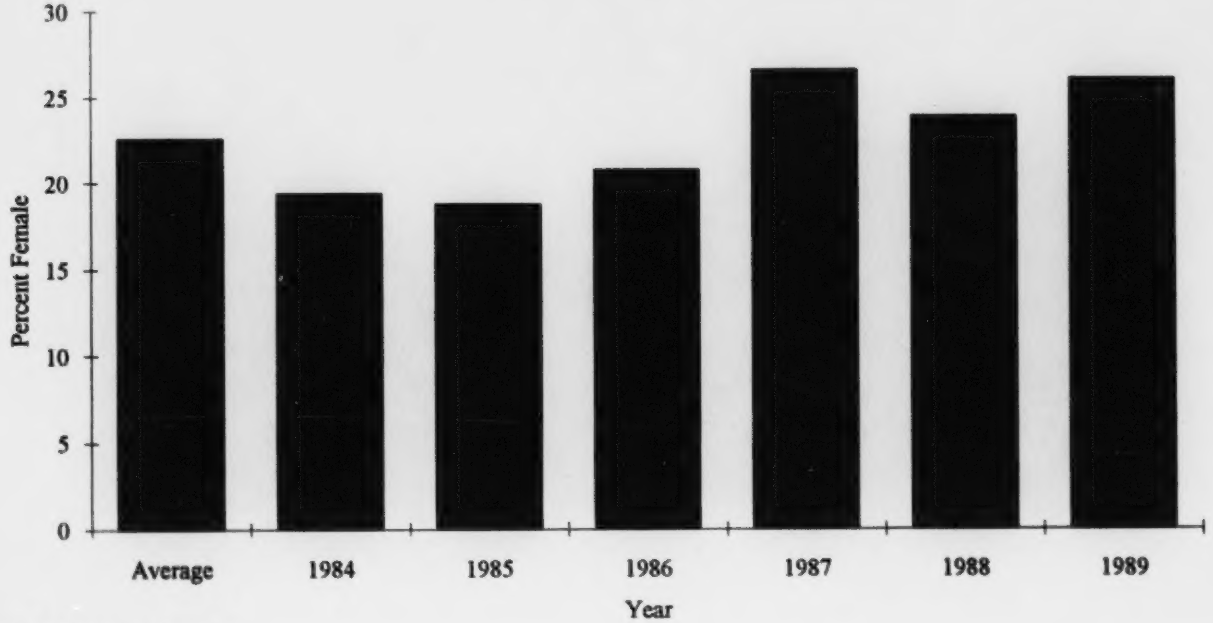
Figure 3.7A - Gender of Principal Investigators



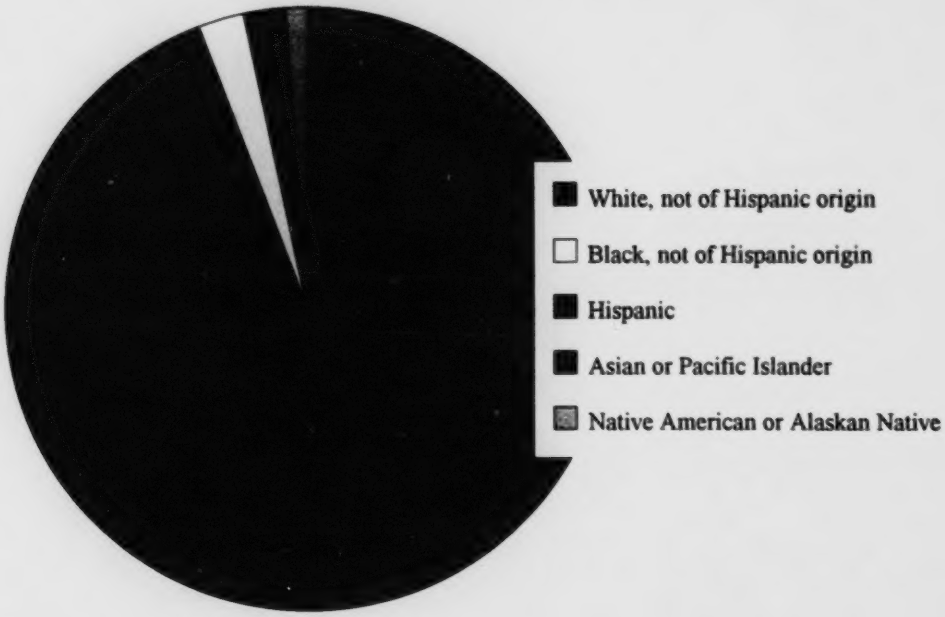
Source: PI Survey - Item 33

Figure 3.7B - Gender of Principal Investigators, by Award Cohort (Percent Female)



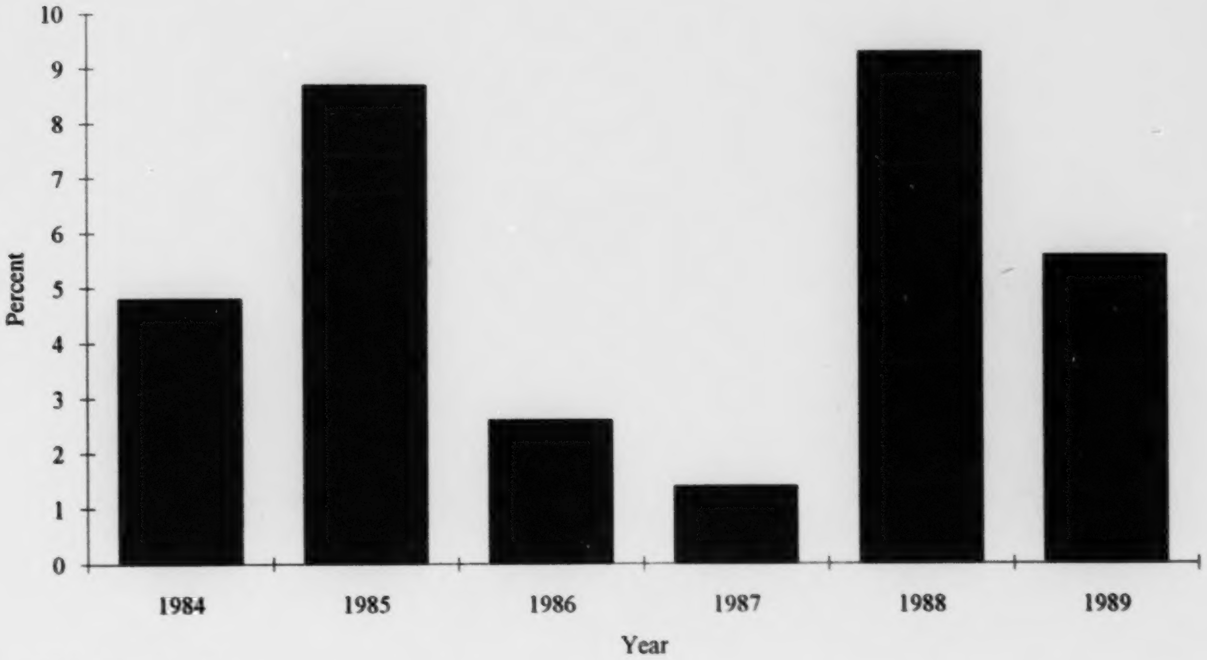
Source: PI Survey - Item 33

Figure 3.8A - Race/Ethnicity of Principal Investigators, by Group



Source: PI Survey - Item 34

3.8B - Percentage Minority Principal Investigators, by Award Cohort



Source: PI Survey - Item 34

The percentage of PIs from minority backgrounds[1] ranged from 1.4 to 9.3 percent of the total. Over time, as seen in Figure 3.8B, the percentage of minority PIs fluctuated within this range with no apparent trend.

3.2.4 Disability Status

NSF also encourages persons with physical disabilities to apply for grants. As seen in Figure 3.9A, between 1984 and 1990, an average of 4.5 percent of all PIs reported having a physical handicap. Over time, the percentage of PIs with physical disabilities has remained relatively constant, ranging from 2.2 percent in 1988 to 6.6 percent in 1984 (see Figure 3.9B).

3.3 Prior PI Experience with TEP Awards

PIs were asked to report whether they had prior experience with teacher enhancement projects for pre-collegiate teachers. As seen in Figure 3.10A, the majority (57.6%) of all PIs reported having such prior experience. PIs who had directed one to three projects comprised 34.3 percent of all PIs, while PIs who had directed four or more projects made up 23.3 percent. Over time, as seen in Figure 3.10B, the experience levels of PIs in teacher enhancement projects have remained even.

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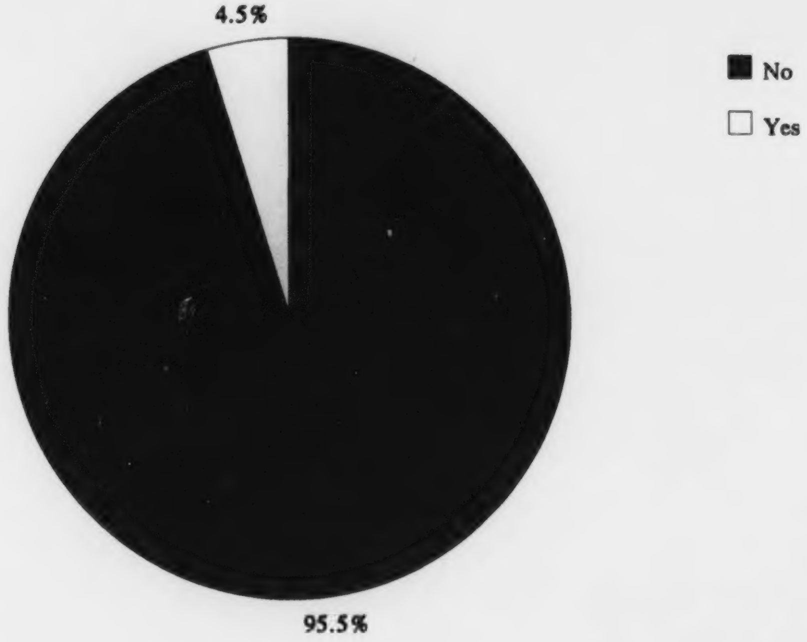
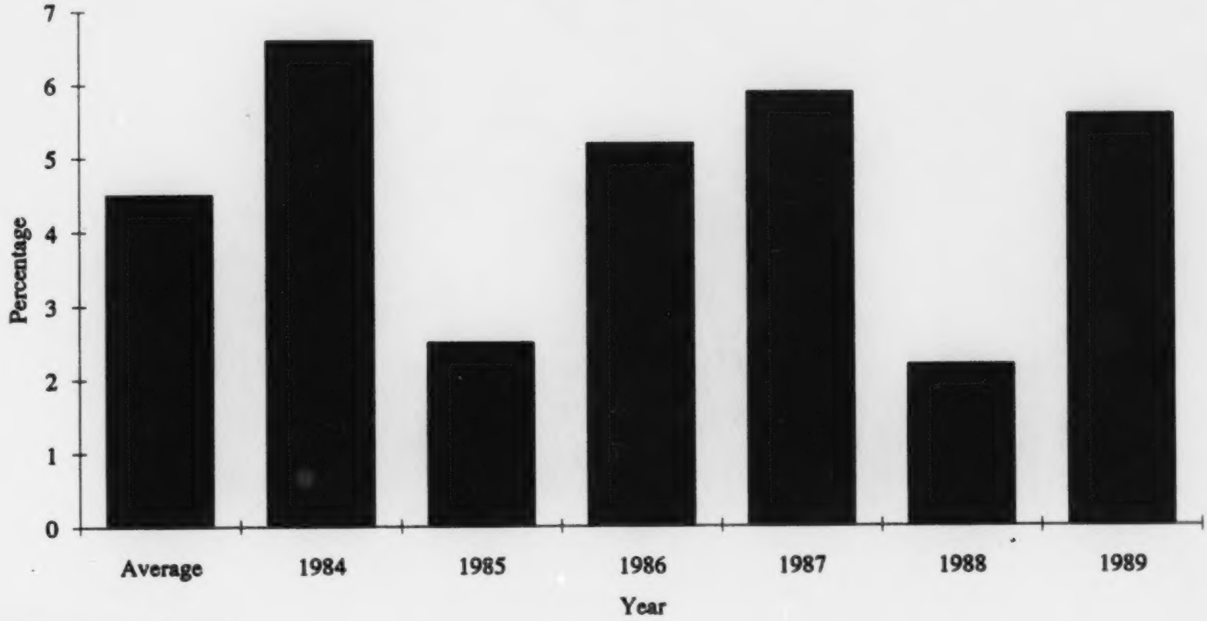
[1] *Minorities are defined by NSF as members of those racial and ethnic groups that are under-represented in science and engineering: American Indians, Blacks, Hispanics, Native Alaskans or Native Pacific Islanders. Asians are not considered to be under-represented in this respect. However, in this study, the OMB classification of "Asian and Pacific Islander" was used. Therefore, it is not possible to estimate the extent to which Pacific Islanders are under-represented in TEP projects.*

Figure 3.9A - Disability Status of Principal Investigators



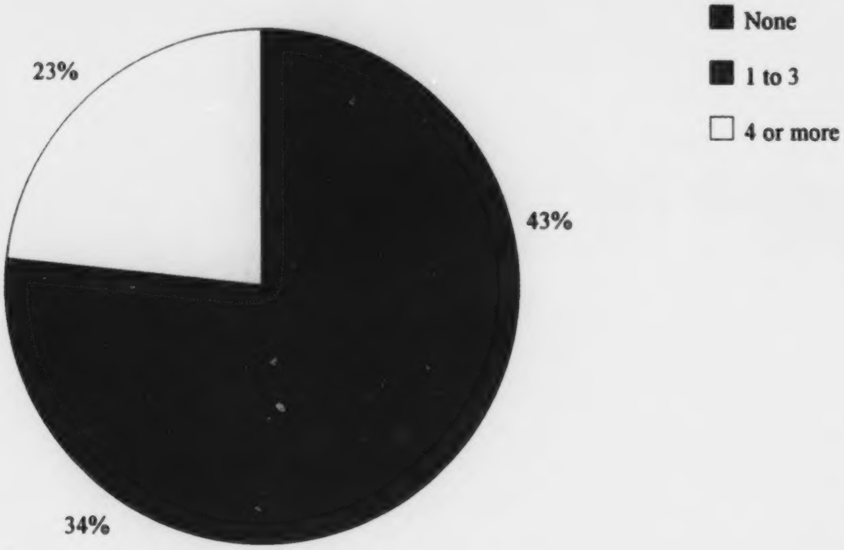
Source: PI Survey - Item 35

Figure 3.9B - Disability Status of Principal Investigators, by Award Cohort



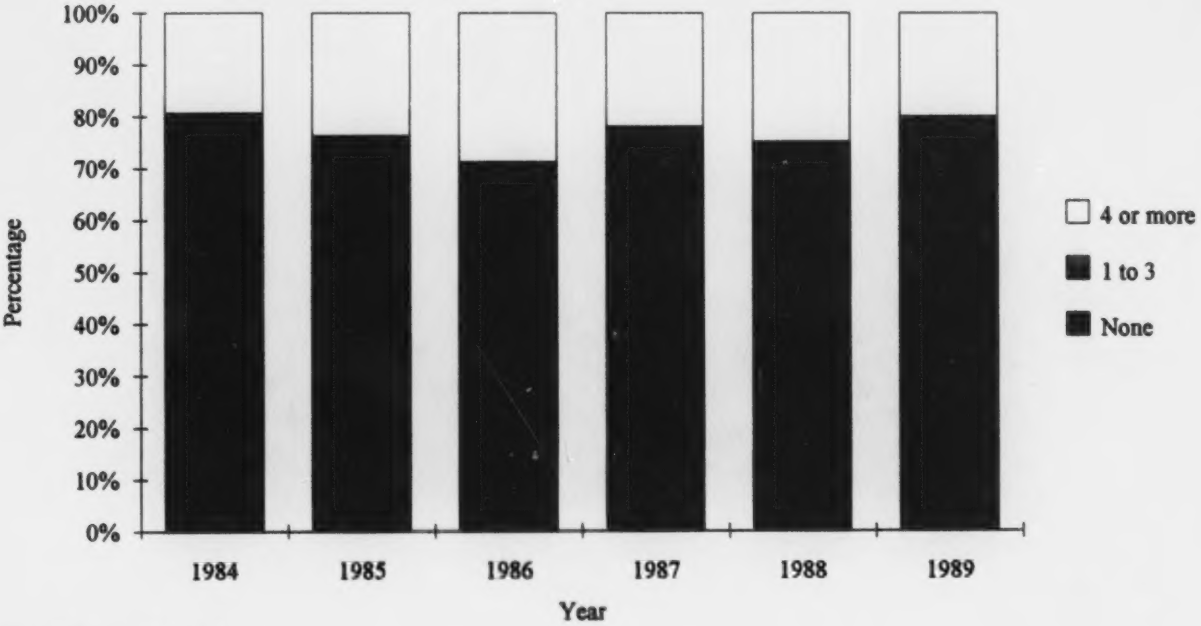
Source: PI Survey - Item 35

Figure 3.10A - Principal Investigator Prior Experience with TEP (Number of Prior TEP Projects Directed)



Source: PI Survey - Item 30

Figure 3.10B - Principal Investigator Prior Experience with TEP, by Award Cohort (Number or Prior TEP Projects Directed)



Source: PI Survey - Item 30

PART TWO

RECRUITMENT OF PARTICIPANTS AND THEIR CHARACTERISTICS

4.0 RECRUITMENT AND SELECTION OF PARTICIPANTS

Eight questions are addressed with respect to the recruitment process.

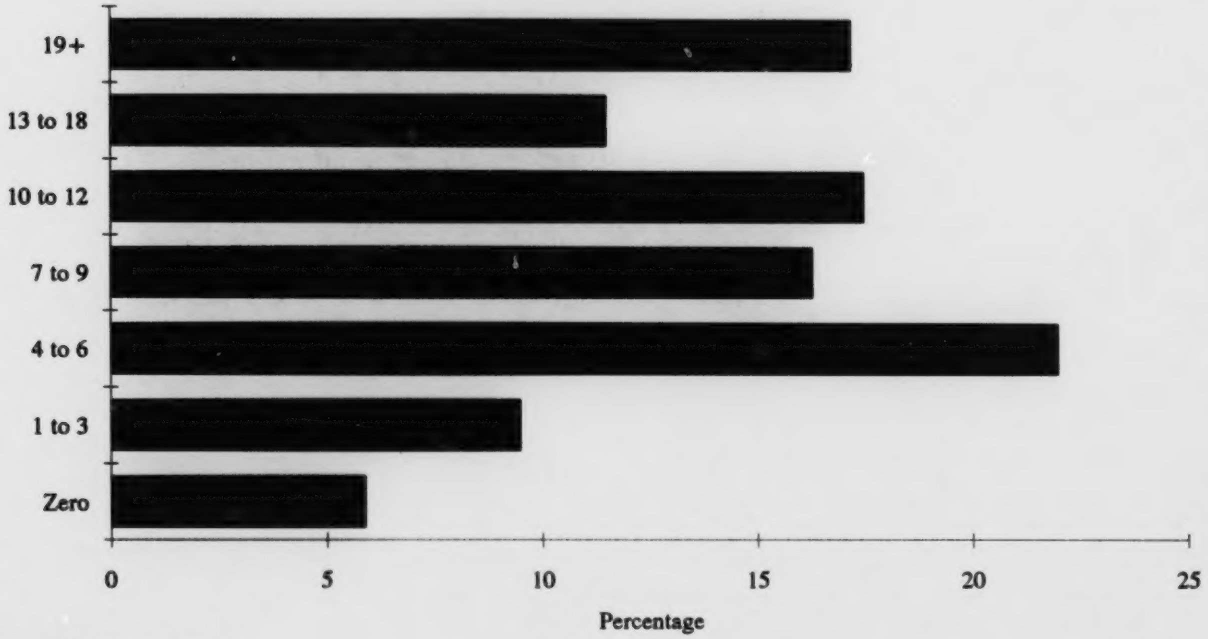
- How much time did PIs have for recruitment?
- What types of participants did they seek to recruit?
- What procedures did they use?
- How did the PIs initially hear about the opportunity to participate in TEP projects?
- How were candidates names received?
- What was the correspondence between supply of openings in TEP projects and participant demand?
- What were the selection criteria?
- Finally, what were the experiences of PIs and Participants among specific participant groups?

4.1 Time Following Award for Recruitment

The effectiveness of any recruitment effort may depend critically upon the amount of calendar time available to the PI. For this reason, PIs were asked to indicate how much time they had for recruitment following notification of receipt of their awards, to assess the adequacy of the amount of time available, and where they indicated that the time was too short, to specify how much time would have been satisfactory. As shown in Figure 4.1, the modal response was 4-6 weeks; the median response was 8 weeks and the mean response was 12 weeks.

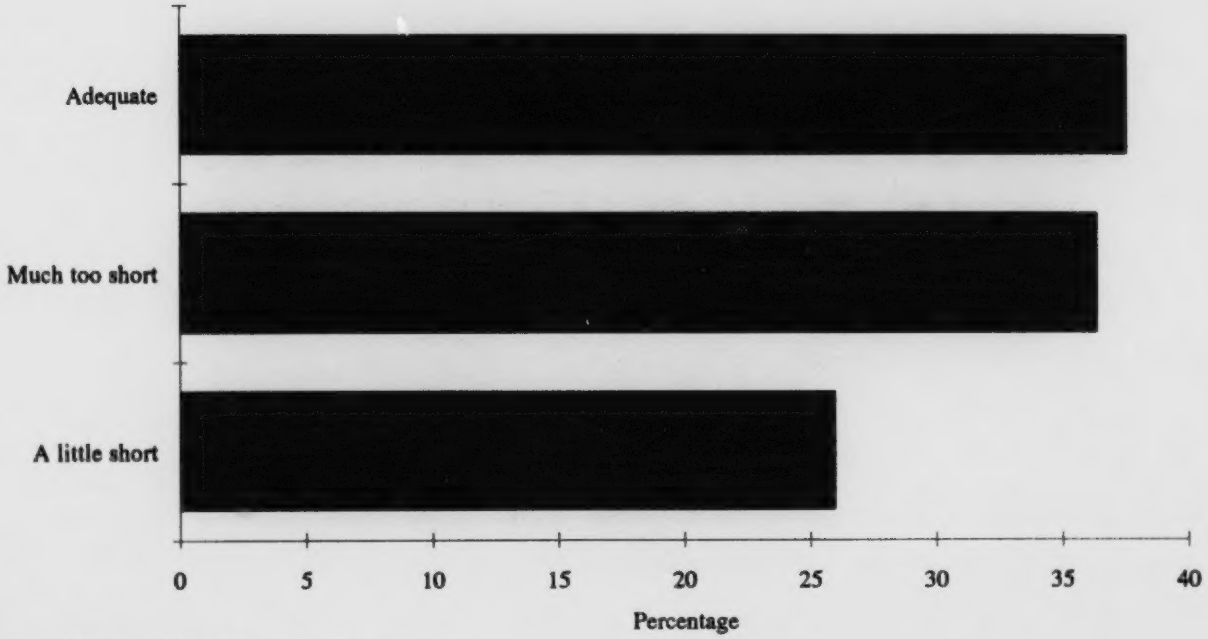
Over the years, the mean number of weeks available for PIs to recruit participants declines from 16 weeks in 1984 to 11 weeks in 1989. Over time, fewer PIs reported having more than 13 weeks for recruitment and an increasing number (12.1% in 1989) reported having zero weeks after the official notification for recruitment.

Figure 4.1 - Number of Weeks of Recruitment Time Available Following Official Notification of Award



Source: PI Survey - Item 6A

Figure 4.2 - Reported Adequacy of Recruitment Time as a Function of the Number of Weeks of Recruitment Time Available



Source: PI Survey - Item 6B

As shown in Figure 4.2, the majority of PIs indicated that the amount of time available for recruitment of participants was at least a little short. Overall, 37.6 percent of PIs agreed that they had adequate time for recruitment, but 26.0 percent reported that time was a little short and 36.4 percent reported that the amount of time was much too short. Over time, the percentage of PIs indicating that the time available for recruitment was adequate fluctuated between 50 and 25 percent.

Finally, among those PIs indicating that the amount of time they had was too short, 31.7 percent felt that 10 to 12 weeks would be sufficient. Among PIs who felt the amount of time was inadequate, as seen in Figure 4.3, 15 weeks time for recruitment was defined as desirable.

4.2 Focus of Recruitment

The focus of the recruitment of TEP PIs should logically play a key role in determining who participates in the TEP projects. Moreover, who participates in a TEP project may, in turn, determine both what project goals are achieved and what impacts the projects have.

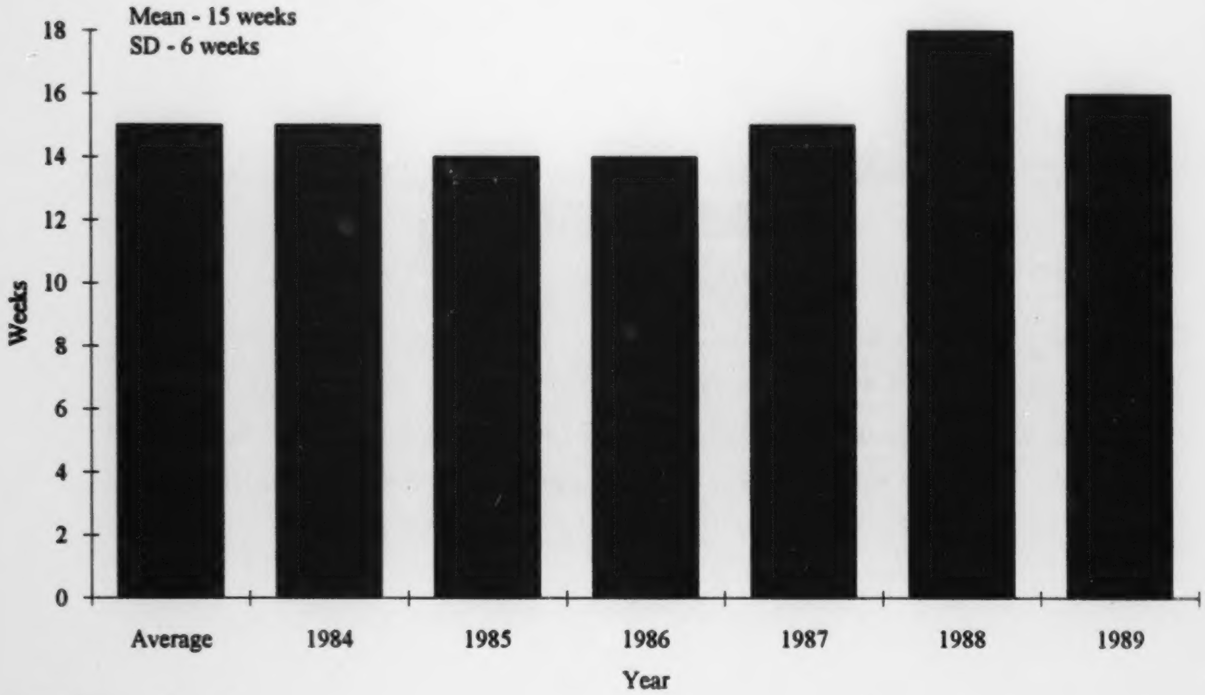
As shown in Figure 4.4, target groups most frequently cited by the PIs were teachers who are expected to assume leadership positions at their schools or districts (49.8%), under-prepared in-service teachers (43.8%), and well-prepared in-service teachers (41.7%). The least frequently identified teacher group was pre-service teachers (0.4%).

Over the years, there was an increased recruiting focus on minority teachers, teachers from economically disadvantaged areas, and teachers who are expected to eventually assume leadership positions in their schools or districts (as their preparation for their teaching responsibilities improves). There was a notable shift away from the recruitment of well-prepared in-service teachers. The percentage of PIs who focused upon recruitment of such teachers declined from 63.3 percent in 1984 to 33.5 percent in 1989.

4.3 Procedures used for General Recruitment

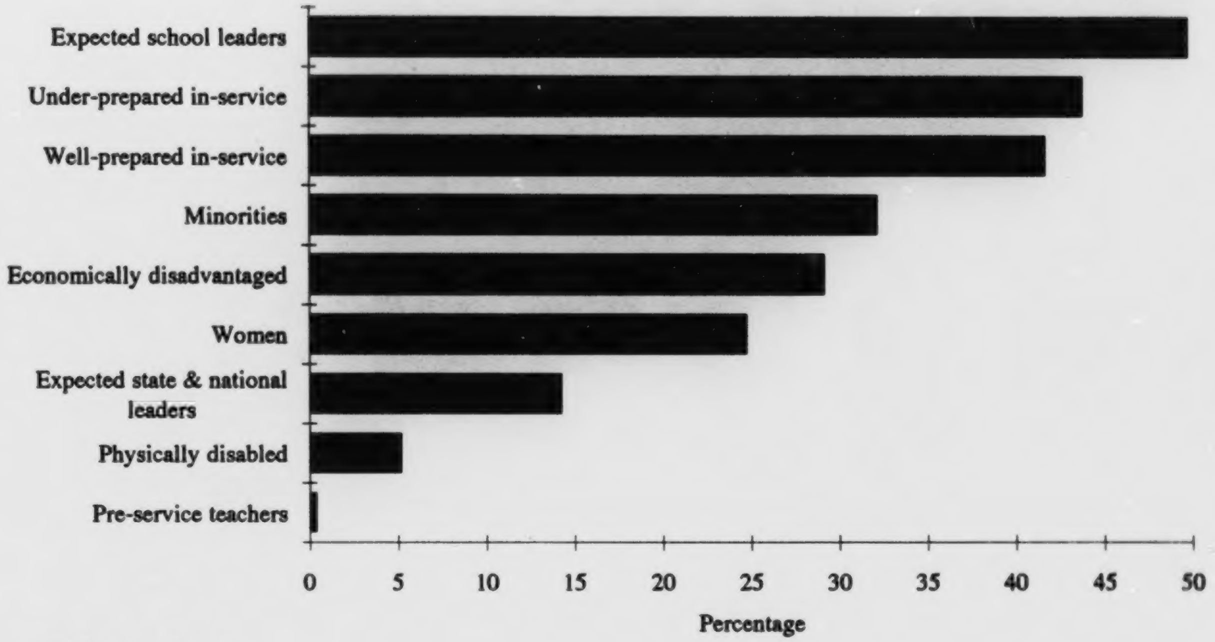
Given who the PIs sought to involve in their TEP projects, the next question addressed was how they chose to reach their intended participants. As shown in Figure 4.5, the most common methods used to recruit teachers for the workshop were sending announcements

Figure 4.3 - Average Time Considered Adequate for Awards by those PIs Reporting Too Little time Available Following Official Notification of Award



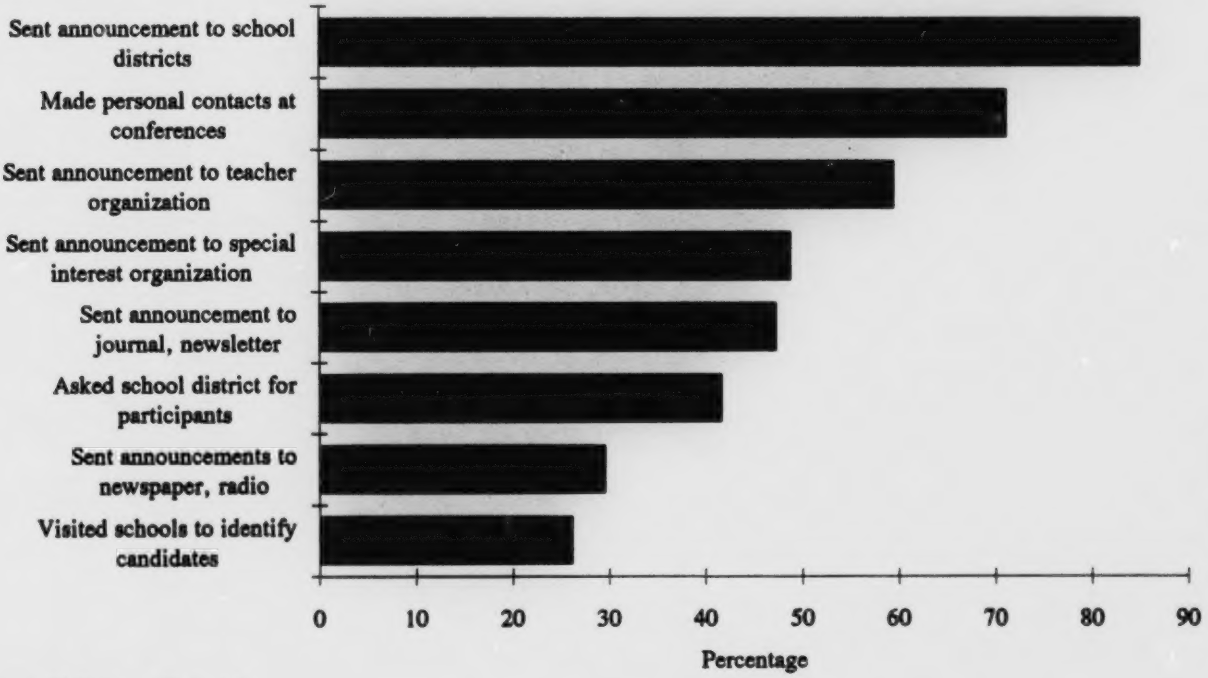
Source: PI Survey - Item 6C

Figure 4.4 - Focus of Teacher Recruitment (Percentage of PIs Rating Group as a Major Focus)



Source: PI Survey - Item 3

Figure 4.5 - Types of Procedures Used for General Recruitment



Source: PI Survey - Item 4A

to local school districts (85.1%), making personal contacts at conferences and meetings (71.3%), and sending announcements to local teacher organizations (59.6%). The least used procedures for general recruitment were school visits to identify teacher candidates (26.2%) and announcements in newspapers and radio (29.6%).

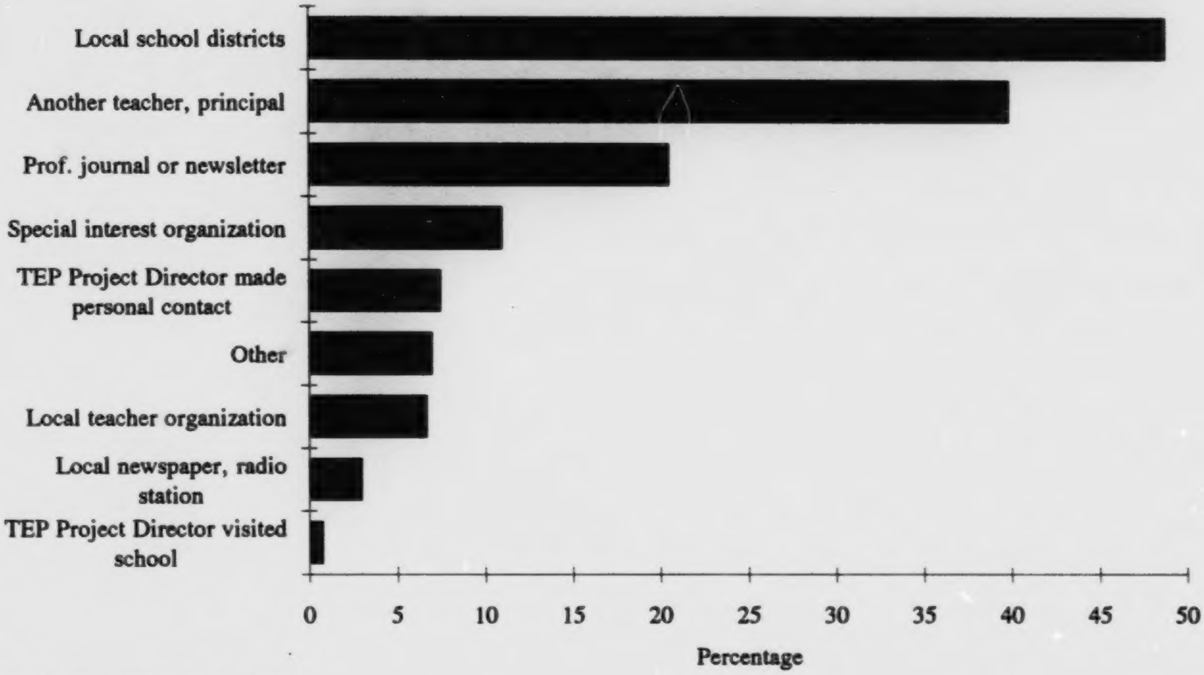
Over time, personal contact at conferences and meetings became an increasingly more important recruitment technique. Personal contacts were used to recruit teachers for 62.3 percent of the projects in 1984 and 79.7 percent of projects in 1989. Other techniques that became more widely used include sending announcements to professional journals, sending announcements to special interest groups, asking school districts to select candidates, and visiting school districts to select participants. In contrast, the percentage of PIs who reported using announcements in local newspapers and radio stations to recruit teachers declined sharply from 42.6 percent in 1984 to 17.4 percent in 1989.

4.4 How Participants Reported that they were Recruited

Up until this point, the PIs' perceptions of recruitment have been spelled out. Participants also reported on how they first learned about the TEP projects in which they participated. As shown in Figure 4.6, the most common sources of information about TEP for participants were their local school districts (48.8%), other teachers or principals (39.9%), and professional journals or newsletters (20.5%). Over time, the importance of local school districts as sources of information about TEP for prospective participants generally increased; 60.5 percent of participants in 1990 first learned about TEP from their local school district compared 44.1 percent in 1984.

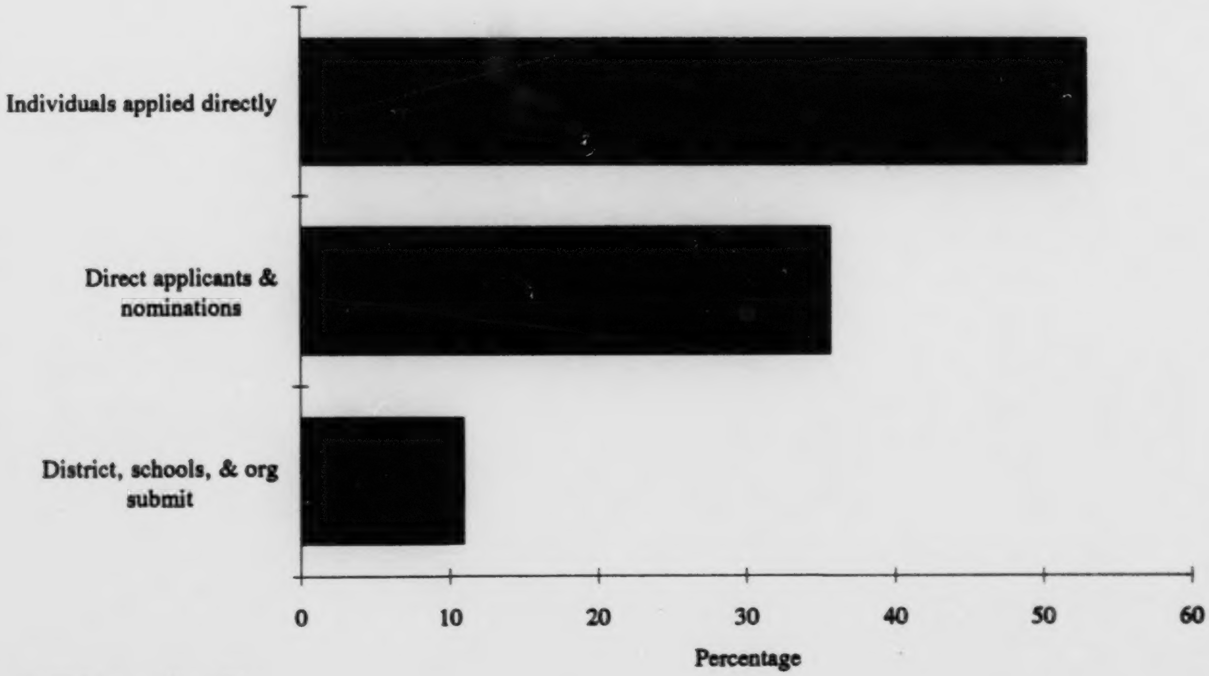
Both TEP PIs and participants reported that local school districts were the most important source of information about the TEP program; 48.8 percent of participants reported that they learned about the opportunity to participate in TEP from their local school districts and 85.1 percent of PIs reported sending announcements to school districts. However, while only 7.5 percent of participants reported having learned about TEP through personal contact with PIs, 71.3 percent of PIs said that they personally contacted participants at conferences.

Figure 4.6 - How Participants First Learned About Their TEP Projects



Source: Participant Survey - Item 1

Figure 4.7 - How PIs Received Names of Applicants



Source: PI Survey - Item 7A

4.5 How Candidates Names are Received

Various ways of receiving the names of prospective applicants are possible. As shown in Figure 4.7, Principal Investigators reported that direct receipt of the individual's application is the most typical way of getting the name of a prospective applicant (53.0%). Another segment of PIs (35.7%) report that they received candidate names from both direct applications and from nominations made by school districts, and other organizations.

The percentage of PIs receiving names of applicants for their projects through the submission of names by schools, districts, or organizations increased from 6.8 percent in 1984 to 16.2 percent in 1989.

4.6 Demand versus Supply of Positions

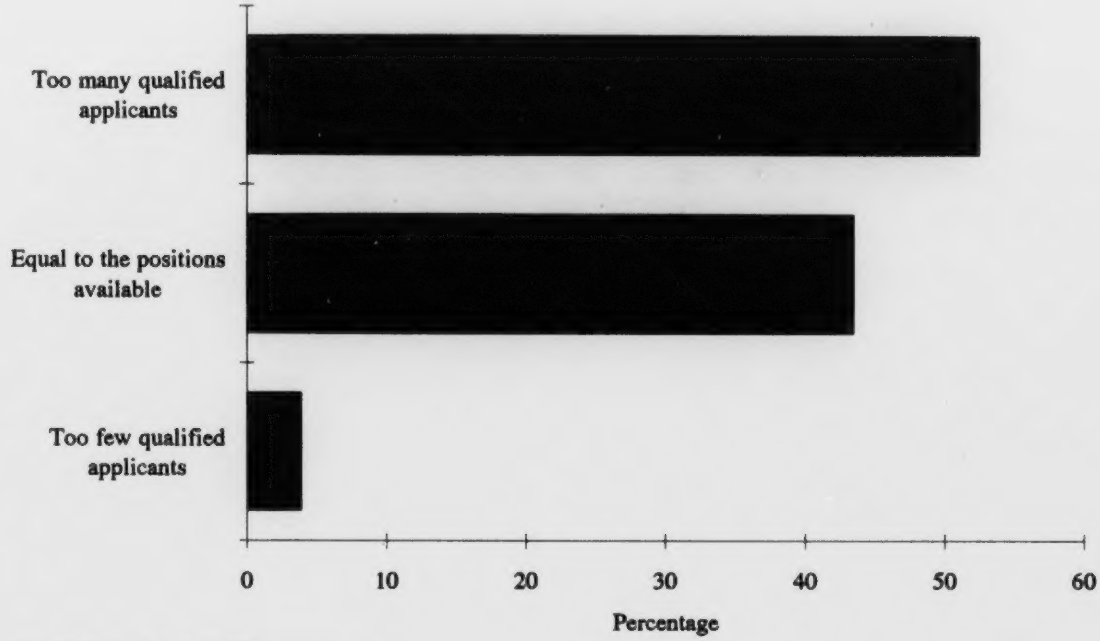
4.6.1 Number of Applicants

PIs were also asked to provide information regarding the balance between demand and supply, i.e., whether or not they typically could serve all applicants, had too many applicants, or too few. In cases where there were too few or too many applicants, PIs were asked to provide quantitative data elucidating this point. As seen in Figure 4.8, the majority of PIs (52.5%) reported that they had received too many qualified applicants for the number of available positions in the program; most of the remaining PIs (43.5%) reported an equal balance between the number of applicants and enrollment. Only a small minority of respondents (3.9%) had too few qualified applicants for the number of available positions.

The percentage of PIs describing the balance between applicants and enrollment as equal, too many, or too few, has remained stable over time. For example, the percentage of PIs who responded that there were too many qualified applicants for the number of available spaces was 55.9 percent in 1984 and 56.3 percent in 1989.

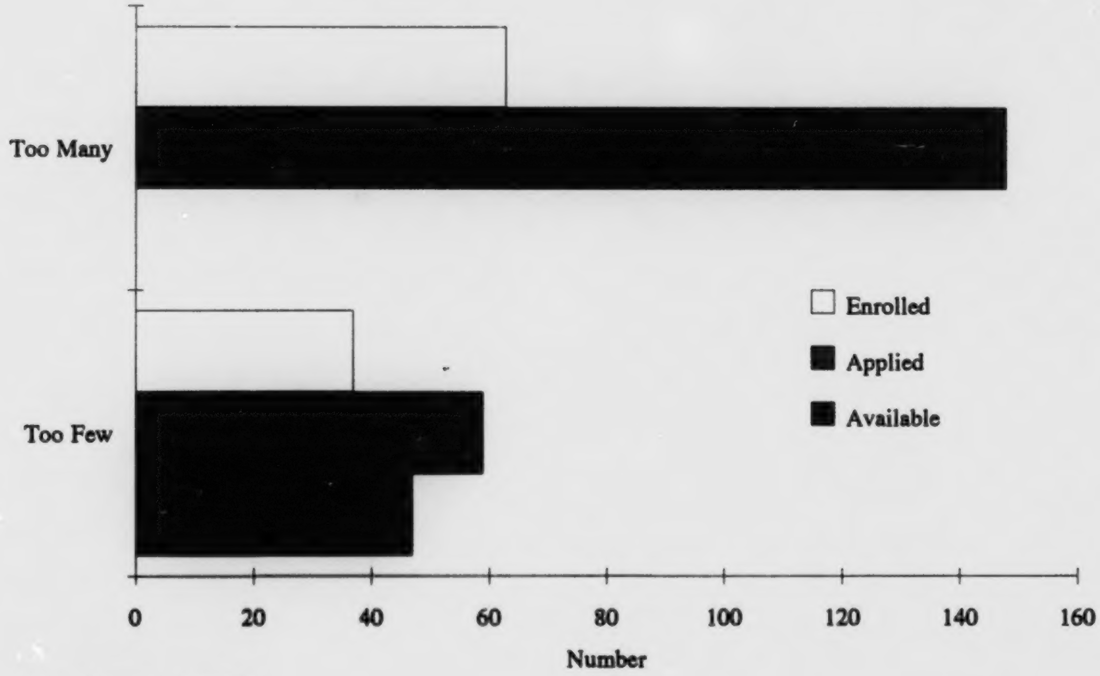
Among those PIs reporting too many qualified applicants, as seen in Figure 4.9, there was an average of 148 applications for 63 available positions. Over the years, the ration of applications to available positions remained consistent; across most years increases or decreases in the number of available positions were matched by a corresponding change in the quantity of applications.

Figure 4.8 - Percent PIs Reporting the Number of Applications as Above, Equal to, or Below the Number of Positions Available



Source: PI Survey - Item 7B

Figure 4.9 - Average Number of Applicant vs. Positions Available



Source: PI Survey - Item 7B

For PIs reporting too few qualified applicants for the number of available positions, there was an average of 47 positions available for which 59 teachers applied and 37 enrolled. Due to the low number of responses to this question (n=16), it is difficult to determine any trends over the six years.

4.6.2 Selection Criteria

PIs were asked to indicate the principal selection criteria they used in accepting participants for their projects. As shown in Figure 4.10, the most frequently cited criteria were that teachers taught subjects covered by the project (43.8%), needed more training in the subject matter (38.3%), and taught an appropriate grade level (37.0%). The least cited reason for selection was "first come - first serve" -- early submission of an application (6.5%).

Over time, whether applicants would be teaching female, minority, or physically disabled students became an increasingly important selection criterion. Teaching students traditionally under-represented in mathematics and science was cited as one of the three most important selection criteria by 16.9 percent of PIs in 1984; this increased to 41.6 percent in 1989. A high level of subject mastery became less important as a selection criterion over time -- it was cited by 27.1 percent of PIs in 1984, but decreased to 16.7 percent in 1989 (with a low in 1987 of 5.1%).

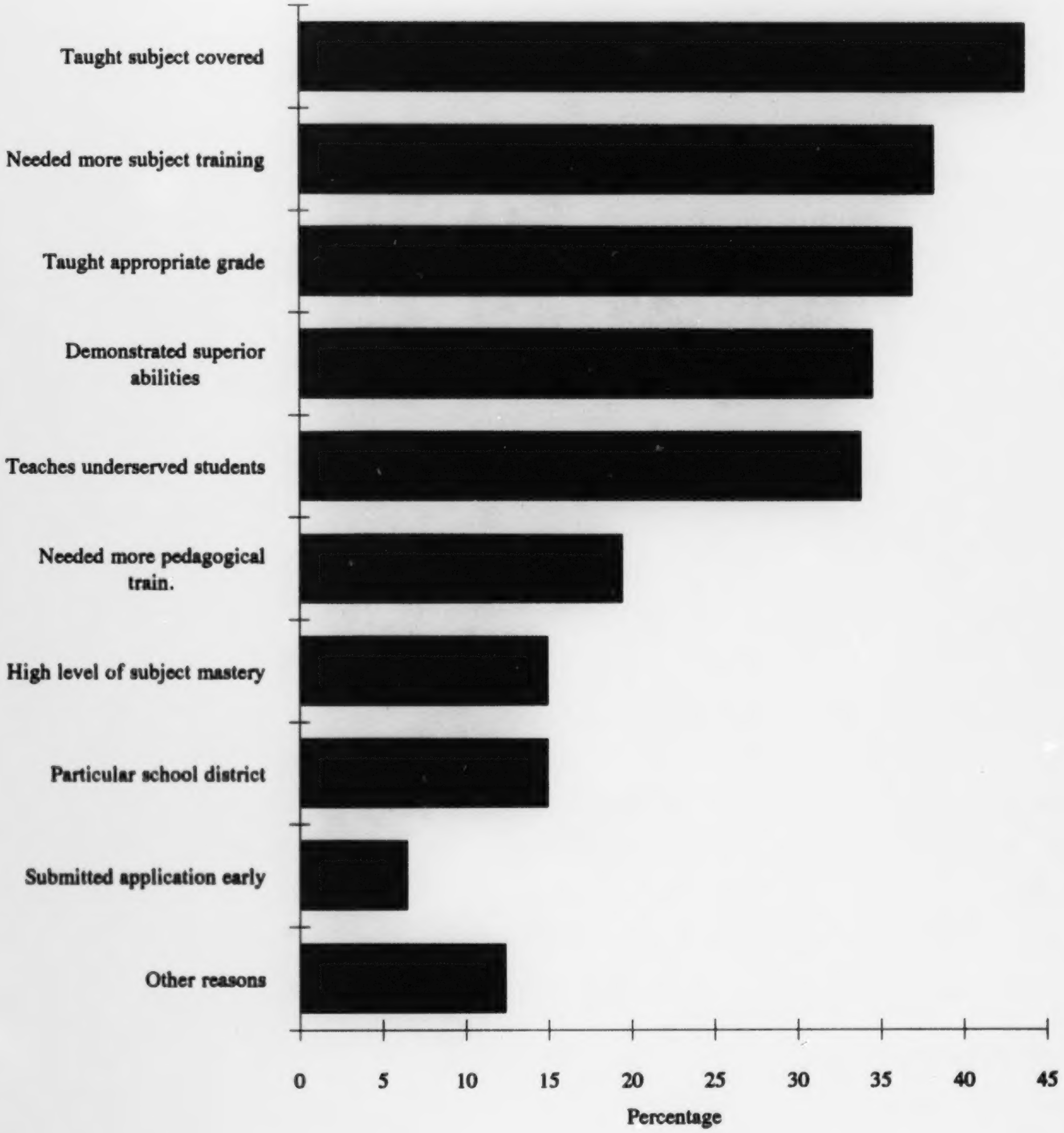
4.7 Recruitment of Special Groups

NSF encourages its PIs to make a special effort in recruiting persons who are underrepresented in sciences and engineering, including women, minorities, and the physically disabled. Related to this, individuals from economically disadvantaged areas are a target group as well. PIs were asked whether or not they used special procedures to recruit in each of these groups, and if so, to specify the methods. Data from participants themselves, also provided documentation of participation among various groups. The findings from both studies, for each group, are summarized in the following sections.

4.7.1 Female Recruitment

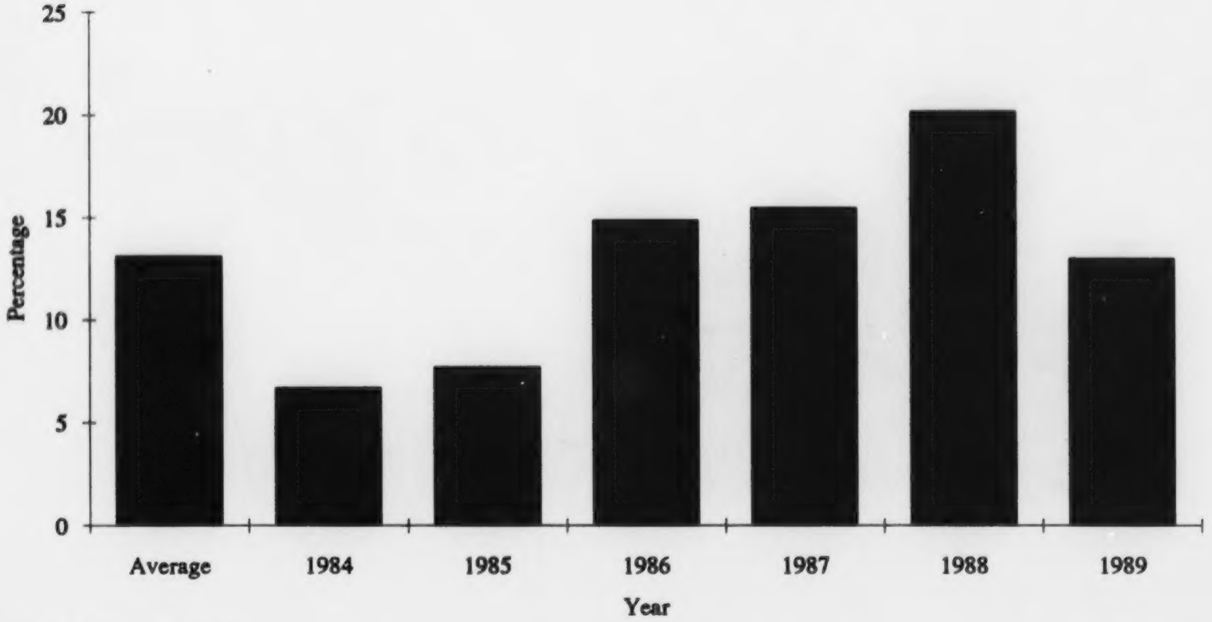
As shown in Figure 4.11A, overtime, the percentage of projects that utilized special procedures to recruit female teachers grew steadily between 1985 (6.7%) and 1988 (20.2%) before dropping to 13.0 percent in 1989. As shown in Figure 4.11B, the most typical methods

Figure 4.10 - Selection Criteria Rated by PIs Among the Three Most Important in Selection of Applicants



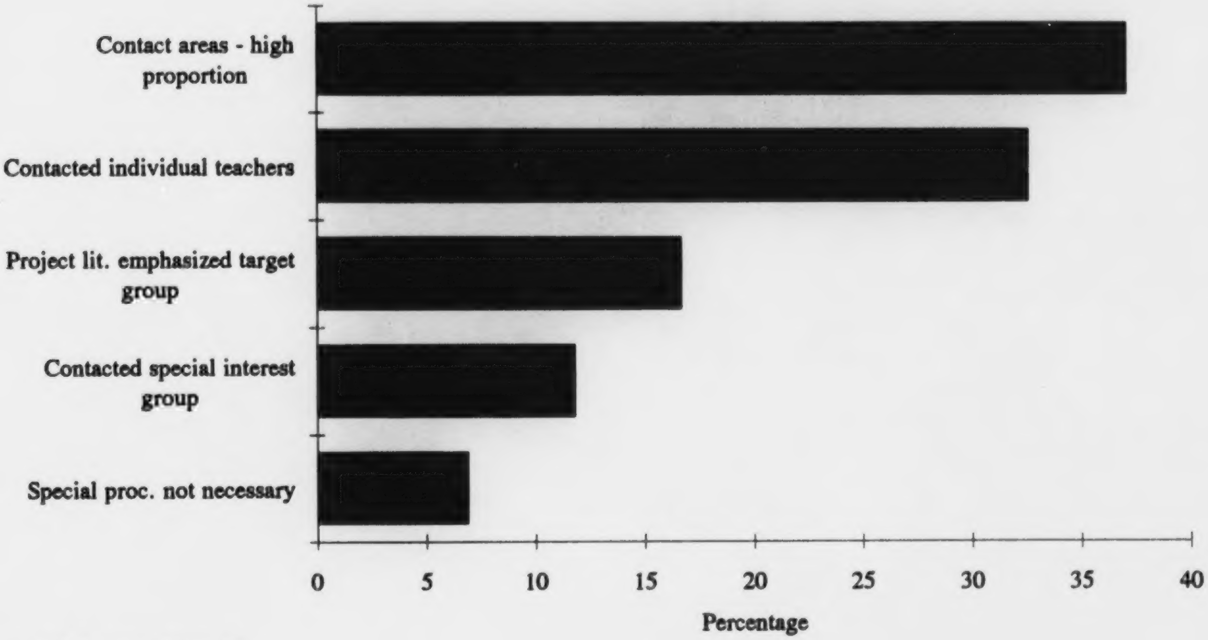
Source: PI Survey - Item 7C

Figure 4.11A - Special Procedures Used to Recruit Female Teachers, by Award Cohort



Source: PI Survey - Item 4B

Figure 4.11B - Special Procedures Used to Recruit Female Teachers, by Recruitment Method



Source: PI Survey - Item 4B

used for this recruitment were contacting schools that had a high proportion of female teachers, and contacting individual teachers for the course. The methods used for recruitment of female teachers varied widely over time and no clear trends emerged.

PIs were also asked to indicate whether their enrollment goals for female participants had been met. As shown in Figure 4.12, 81.8 percent of PIs reported meeting their enrollment goals for female teachers. Over time, the percentage of PIs that reported meeting their goals remained fluctuated little, ranging from 76.3 percent in 1985 to 93.8 percent in 1988.

PIs reported that female participants made up an average of 61.3 percent of participants in TEP projects. As shown in Figure 4.13, the percentage of female participants in TEP projects, according to PIs, increased from 53.1 percent in 1984 to 60.0 percent in 1989 with a high of 70.0 percent in 1986.

In terms of the actual distribution by gender in the projects, as shown in Figure 4.14, 57.4 percent of participants were female. According to data provided by the participants, over time the percentage of female TEP participants generally increased each year and ranged between 46.7 percent in 1985 and 65.7 percent in 1988.

4.7.2 Minority Recruitment

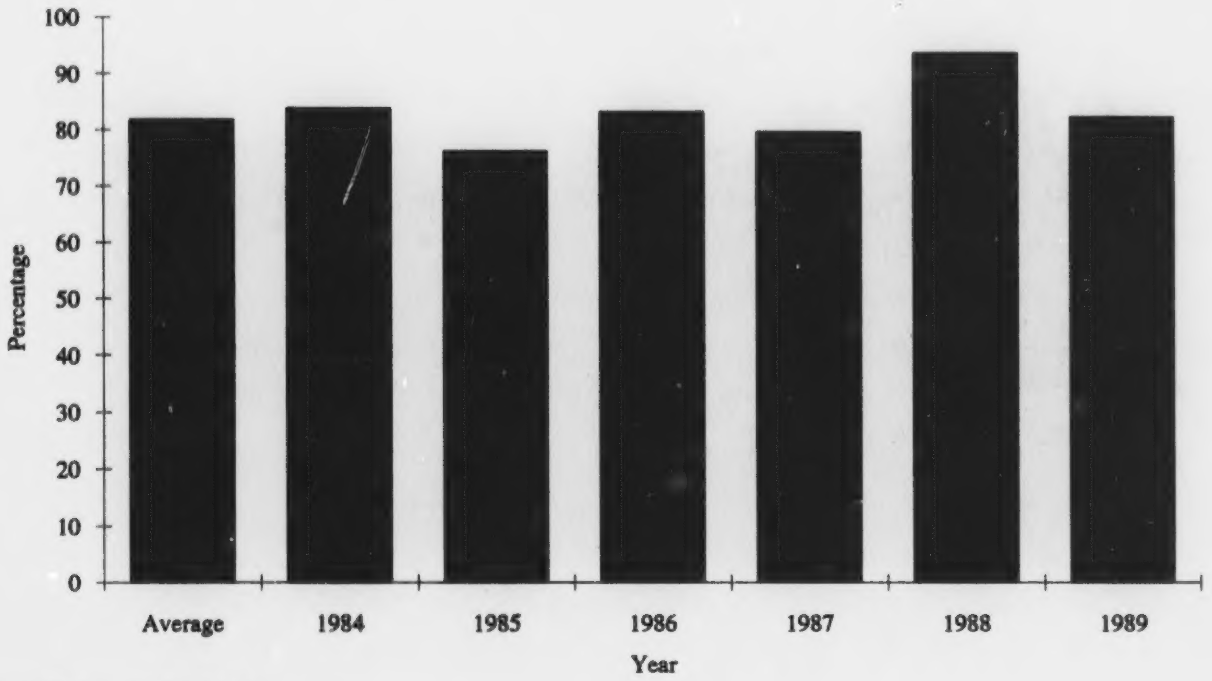
As shown in Figure 4.15A, over time, the percentage of PIs that reported utilizing special procedures to recruit minority teachers to the program increased from 28.3 percent in 1984 to 48.4 percent in 1989. For projects awarded in 1988, 57.5 percent reported utilizing special procedures to recruit minority teachers.

As shown in Figure 4.15B, the most common methods used for recruitment were contacting areas that had a high proportion of minority teachers (50.6 percent), communicating with individual teachers (25.8%), and notifying special interest groups (10.1%).

PIs were also asked to indicate whether their enrollment goals for minority participants had been met. As shown in Figure 4.16, across all years 41.1 percent of PIs reported having met their enrollment goals for minority teachers. Over time, the percentage of PIs that met their enrollment goals for minority teachers ranged from 34.2 percent in 1985 to 54.2 percent in 1988.

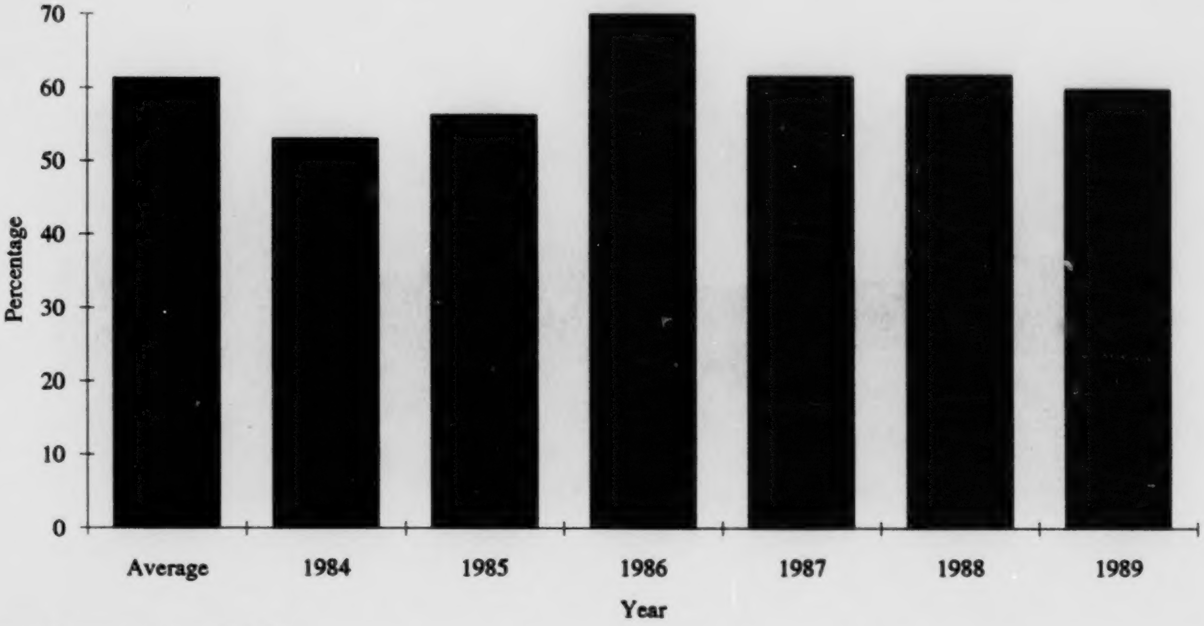
According to PIs, as seen in Figure 4.17, minority participants made up an average of 17.6 percent of participants in TEP Projects. Black participants (not of Hispanic origin) comprised 11.0 percent of all participants, while 3.3 percent of participants were Hispanic, 2.2

Figure 4.12 - Percent Reporting Meeting Enrollment Goals for Female Teachers



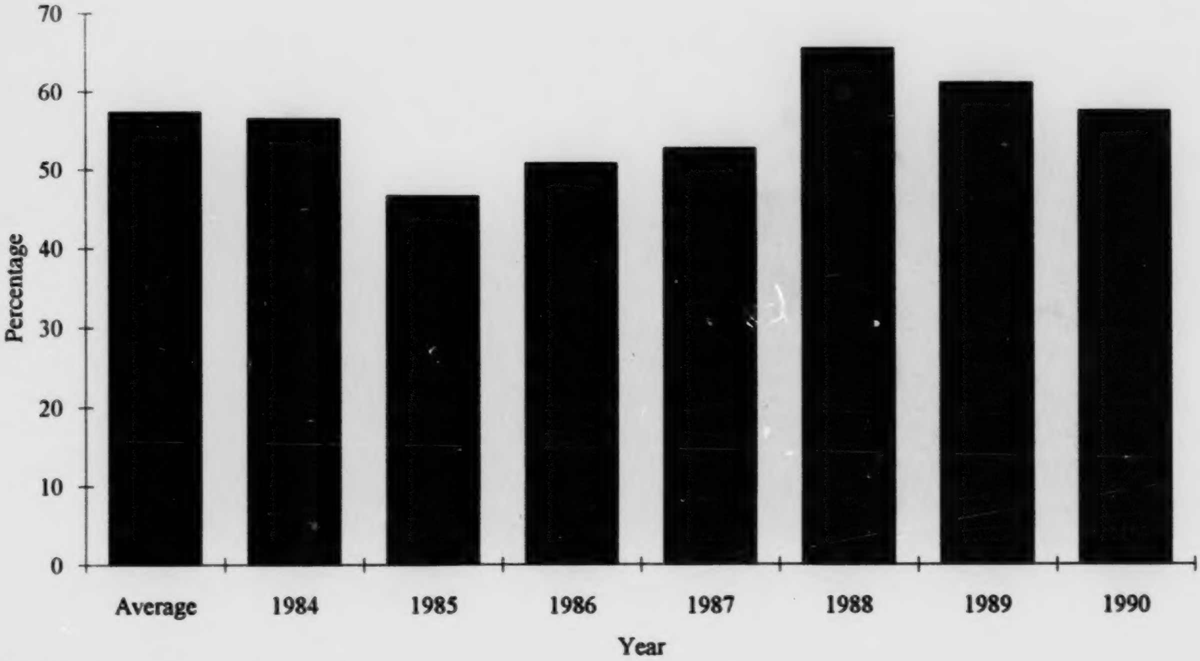
Source: PI Survey - Item 11A

Figure 4.13 - PI Reported Female Participation Among TEP Projects, by Award Cohort



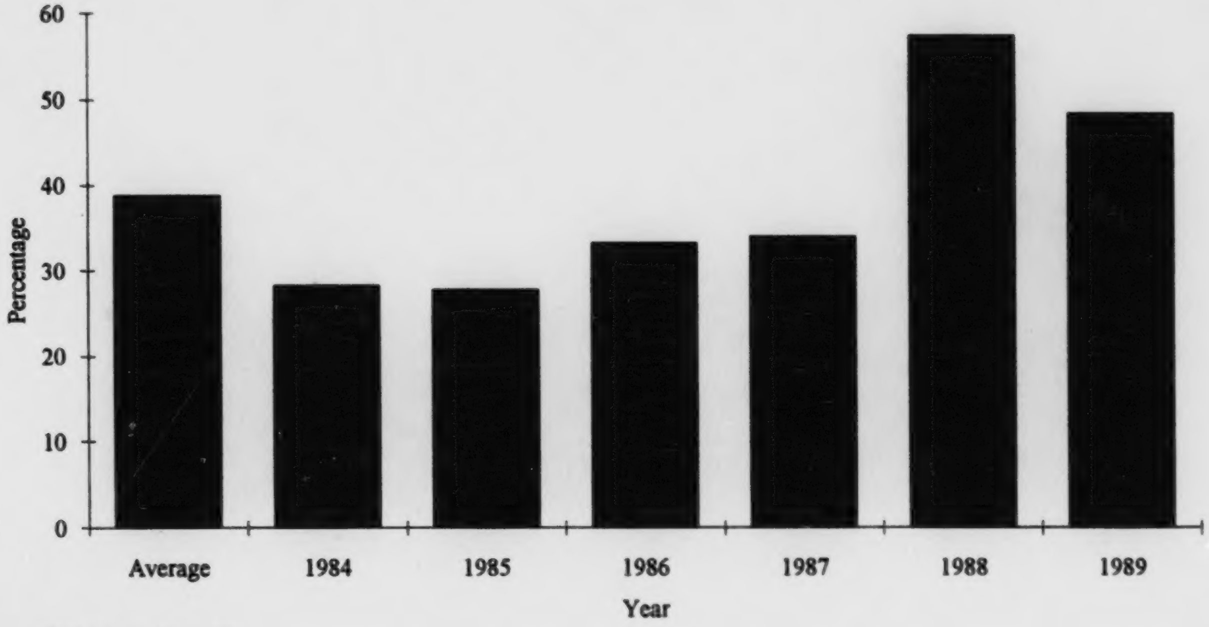
Source: PI Survey - Item 10A (2)

Figure 4.14 - Gender of Participants, by Award Cohort



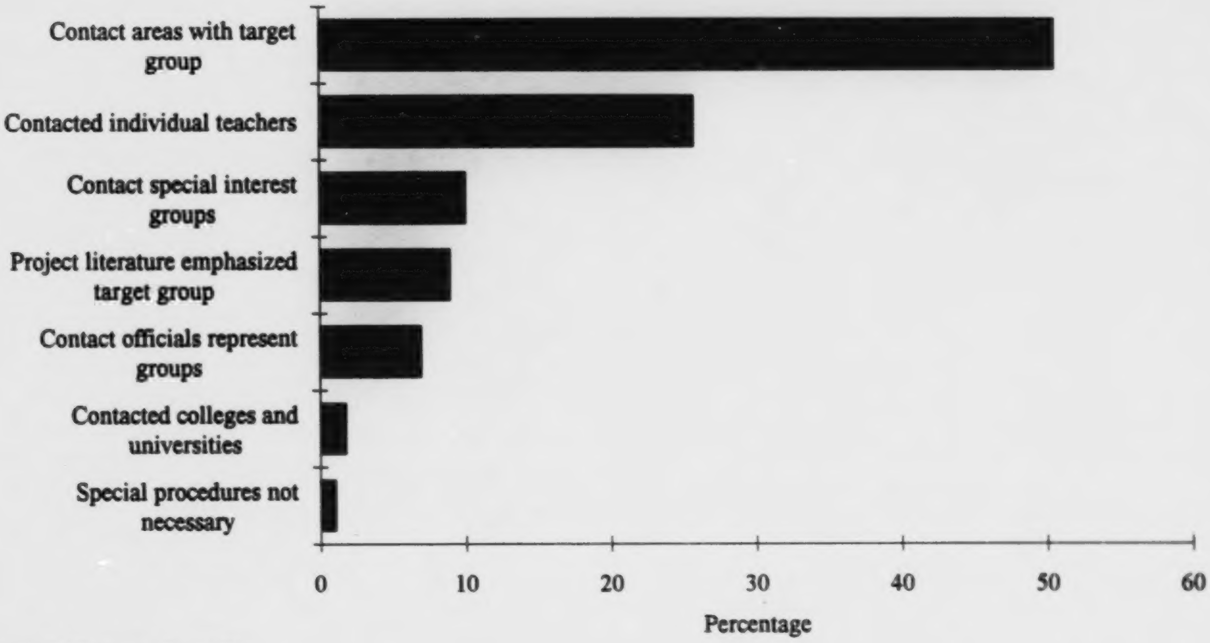
Source: Participant Survey - Question 43

Figure 4.15A - Special Procedures Used to Recruit Minority Teachers, by Award Cohort



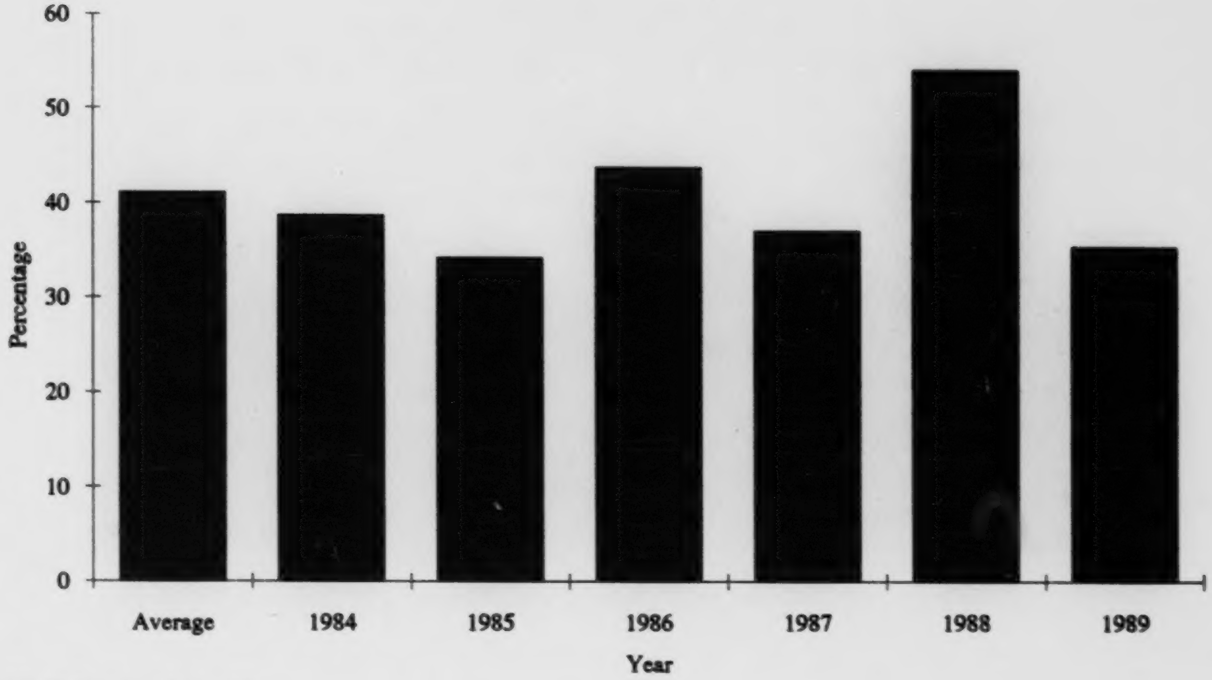
Source: PI Survey - Item 4B

Figure 4.15B - Special Procedures Used to Recruit Minority Teachers, by Recruitment Method



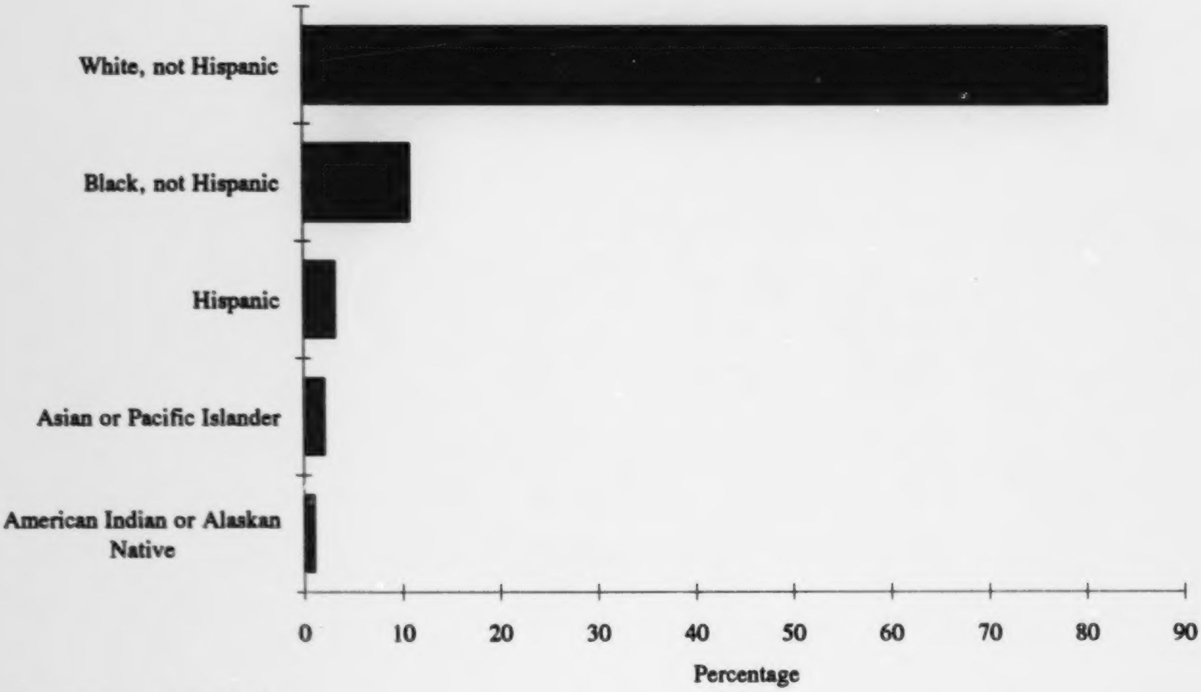
Source: PI Survey - Item 4B

Figure 4.16 - Met Enrollment Goals for Minority Teachers, by Award Cohort



Source: PI Survey - Item 10B

Figure 4.17 - PI Reported Racial/Ethnic Composition of TEP Projects, by Award Cohort



Source: PI Survey - Item 10A(1)

percent were Asian or Pacific Islander, and 1.1 percent were American Indian or Alaskan Native. Whites (not of Hispanic origin) made up 82.4 percent of all participants.

Finally, participants were asked to indicate their own race or ethnicity. As shown in Figure 4.18A, 87.8 percent of all participants reported that they were White (not of Hispanic origin). Blacks (not of Hispanic origin) comprised 7.9 percent of all participants, 3.3 percent were Hispanic, 2.2 percent were Asian or Pacific Islander, and 1.1 percent were American Indian or Alaskan Native. All of these percentages are slightly lower than the corresponding percentages provided by the PIs, while PIs reported that 17.6 percent of all participants were minorities, only 12.2 percent of participants identified themselves as members of under-represented populations.

Over time, as shown in Figure 4.18B, the percentage of minority participants remained relatively stable ranging from 8.5 percent to 16.5 percent of all participants.

Aside from any direct recruitment of minority individuals, PIs were also asked whether or not they made any special efforts to recruit from schools or districts with high minority enrollments. As shown in Figure 4.19, over time the percentage of PIs that reported making special efforts to recruit teachers from districts with high minority enrollments increased from 51.7 percent in 1984 to 70.1 percent in 1987. Since 1987, the percentage of PIs reporting this type of recruitment has stabilized at approximately 70 percent.

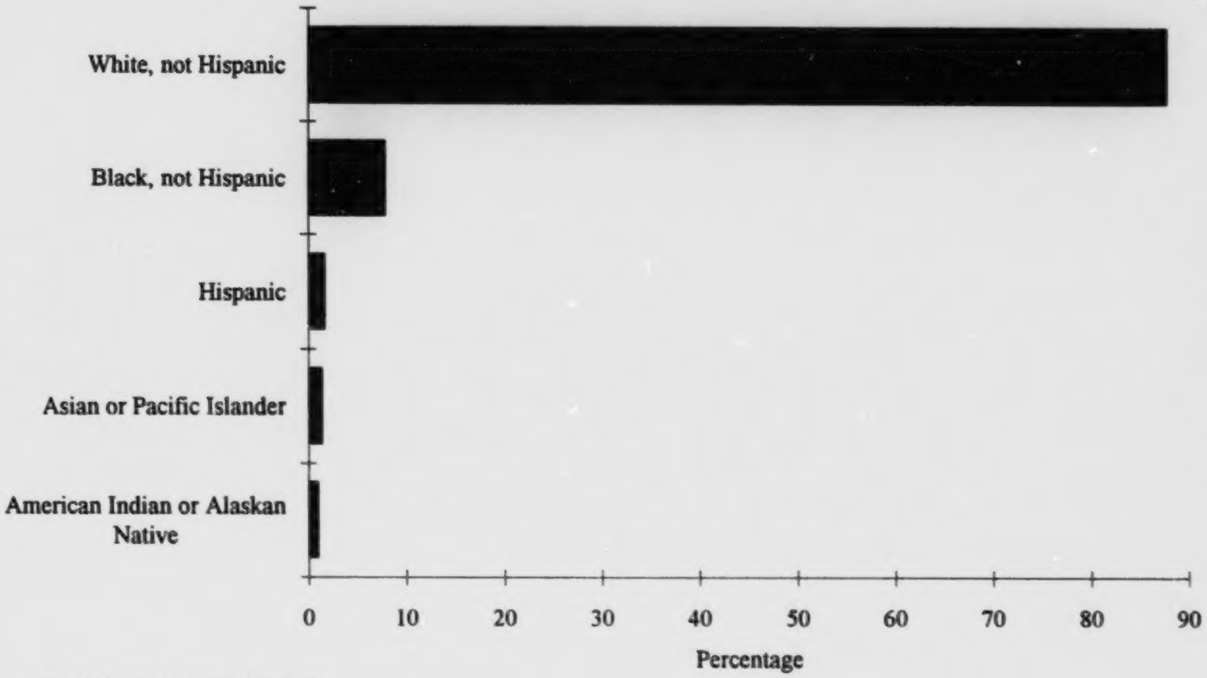
Among those PIs reporting that they made such efforts, 33 percent were recruited from one district, 23 percent from two districts, 14 percent from three districts, to 30 percent from three or more districts.

Participants were asked to describe the racial and ethnic composition of their own school districts. As shown in Figure 4.21, according to participants, 62.4 percent of their students are White (not of Hispanic origin), 21.0 percent are Black (not of Hispanic origin), 8.0 percent are Hispanic, 3.8 percent are Asian or Pacific Islander, and 1.4 percent are Native American or Native Alaskan.

4.7.3 Recruitment of Persons with Physical Disabilities

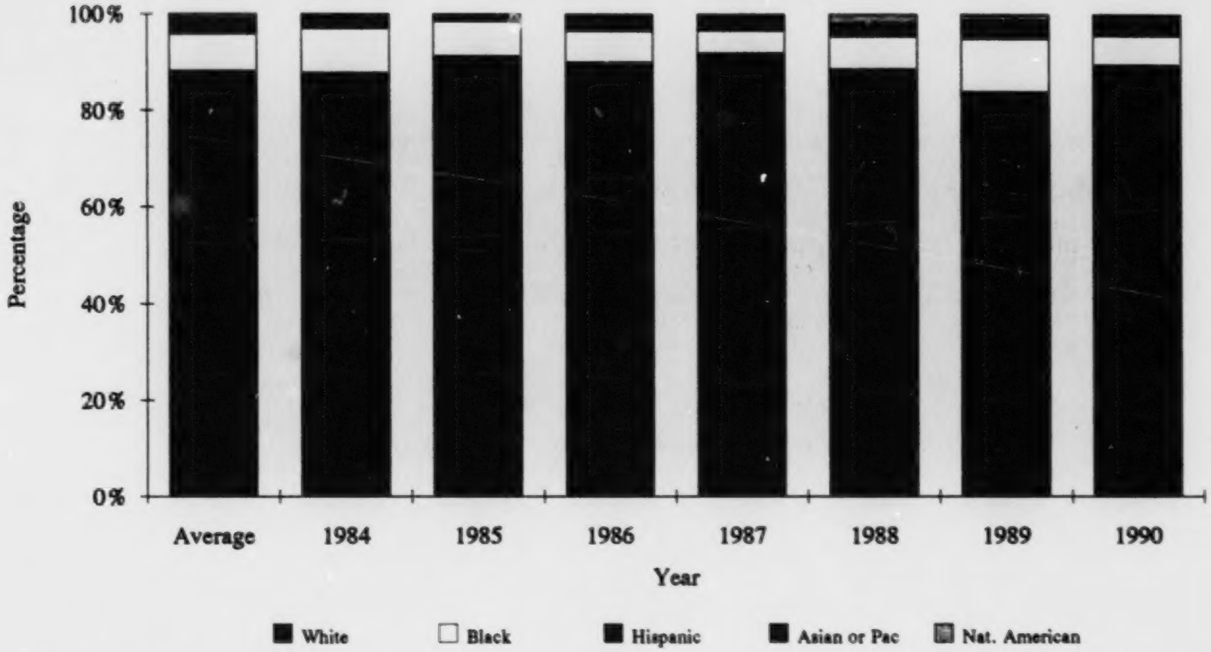
Over time, as seen in Figure 4.22A the percentage of PIs who utilized special procedures to recruit teachers with physical disabilities varied from 0 to 5.9 percent. Across all years, an average of 3.6 percent of PIs reported utilizing special procedures to recruit teachers with physical disabilities. Of these, as seen in Figure 4.22B, the most common

Figure 4.18A - Race and Ethnicity of Participants



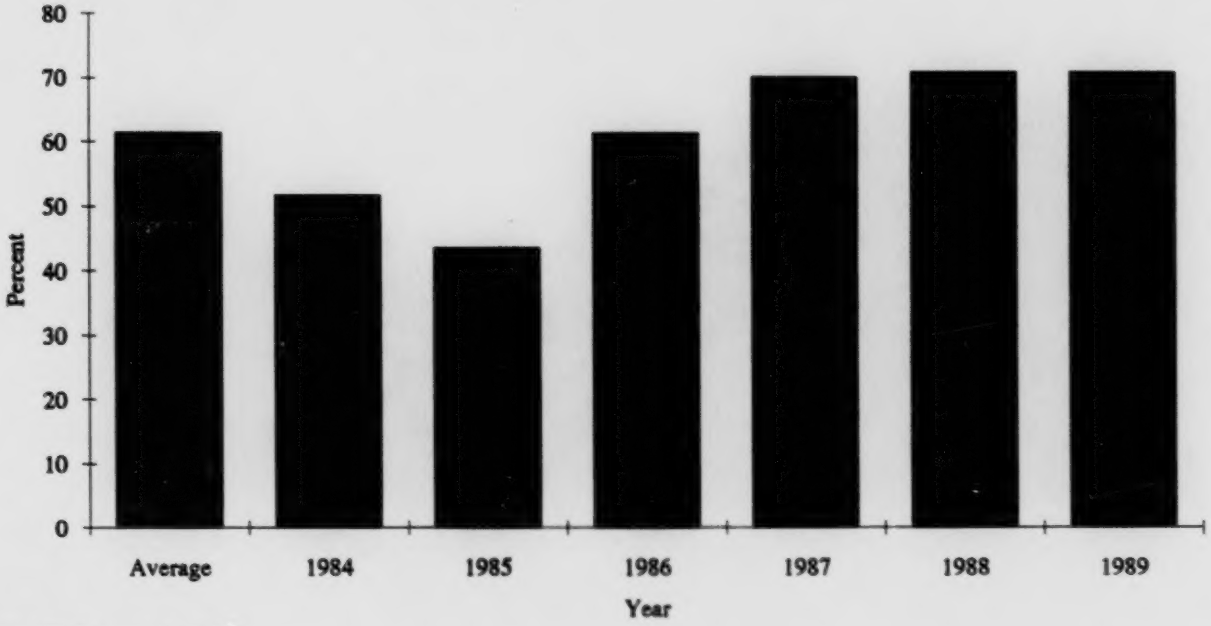
Source: Participant Survey - Item 42

Figure 4.18B - Race and Ethnicity of Participants, by Award Cohort



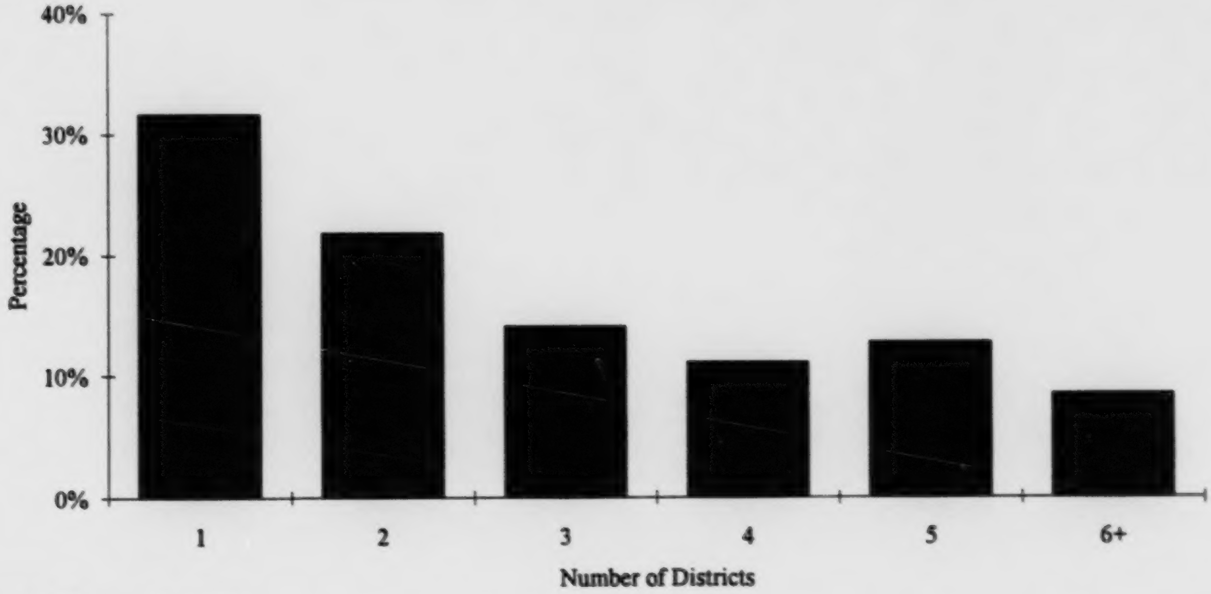
Source: Participant Survey - Item 42

Figure 4.19 - Special Efforts Made to Recruit Teachers from Districts with High Minority Enrollments



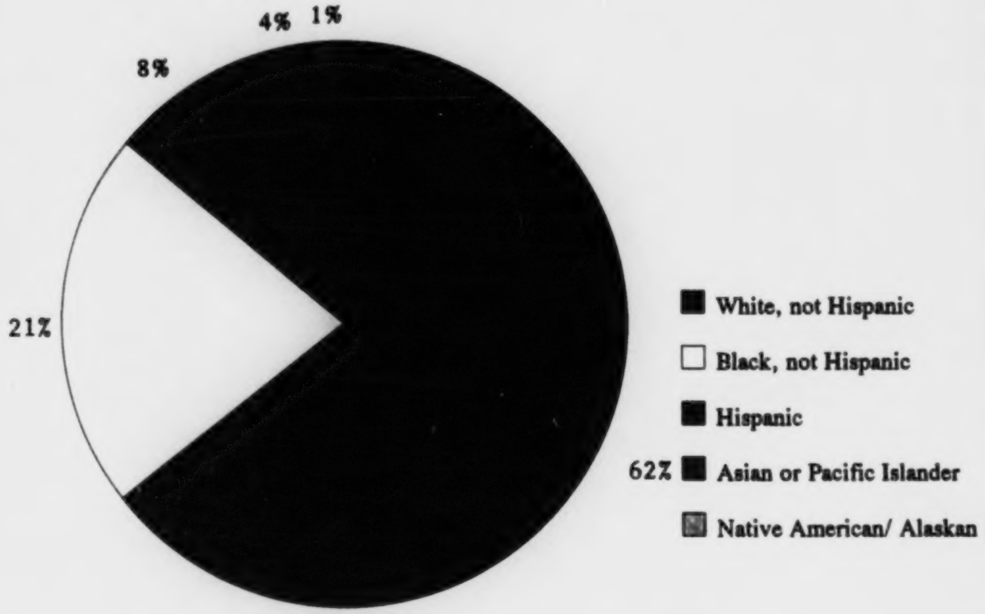
Source: PI Survey - Item 5A

Figure 4.20 - Number of Minority High School Districts in Which Targeted Minority Recruiting Occured (Percentage of Respondents Who Listed One or More Districts)



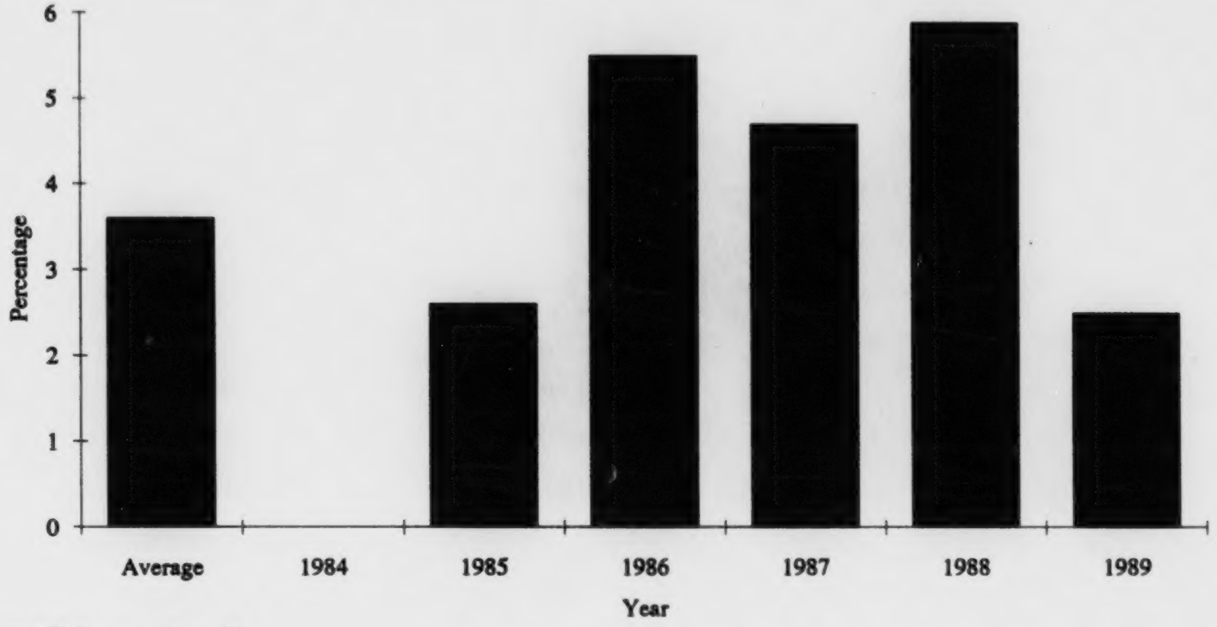
Source: PI Survey - Item 5B

Figure 4.21 - Racial and Ethnic Composition of Participants' School Districts



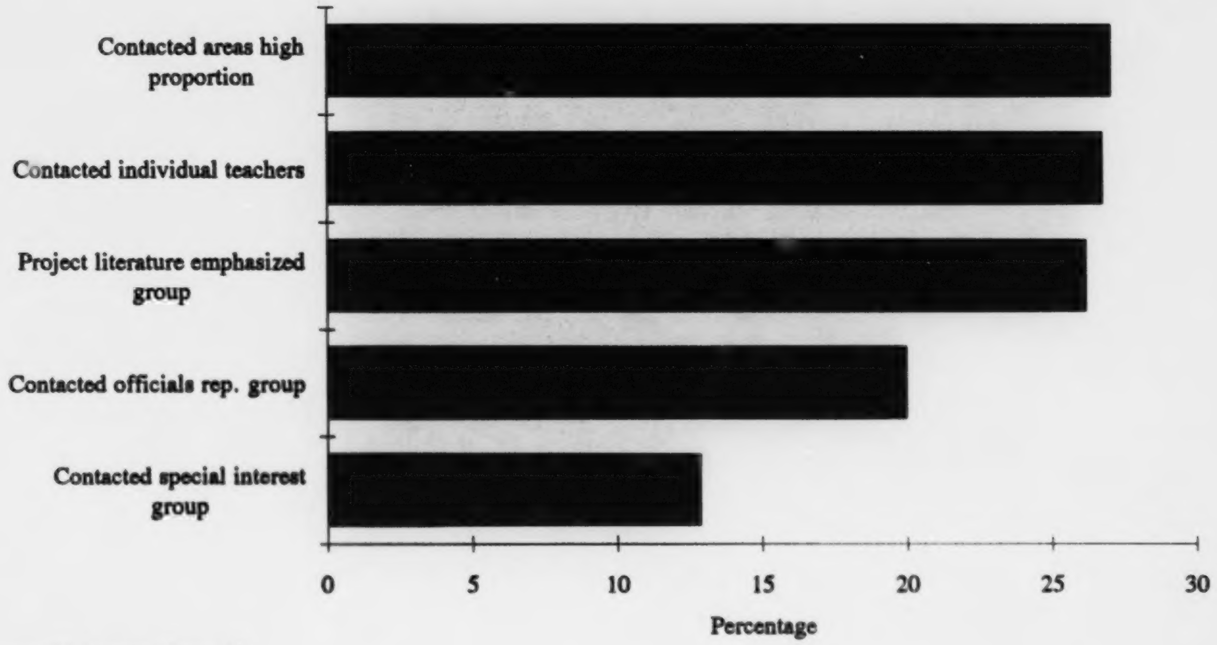
Source: Participant Survey - Item 27c.

Figure 4.22A - Special Procedures Used to Recruit Teachers with Physical Disabilities, by Award Cohort



Source: PI Survey - Item 4B

Figure 4.22B - Special Procedures Used to Recruit Physically Disabled Teachers, by Recruitment Method



Source: PI Survey - Item 4B

methods used for this recruitment were contacting areas with a high proportion of physically disabled teachers (27.1%), communicating with individual teachers (26.8%), and emphasizing the physically disabled in the project literature (26.2%).

PIs were also asked to indicate whether their enrollment goals for participants with physical disabilities had been met. As shown in Figure 4.23, only 8.5 percent of PIs reported having met their enrollment goals for teachers with disabilities.

According to PIs, as seen in Figure 4.24, participants with physical disabilities made up an average of 1/2 percent of participants in TEP Projects. As shown in Figure 4.27, overtime, this percentage ranged from .19 percent in 1988 to .89 percent in 1986 with no clear trend emerging over the six years.

As seen in Figure 4.25, the percentage of participants that reported having a physical handicap was substantially higher than was reported by PIs. Across all years, 3.0 percent of participants reported that they had a physical handicap, compared to the 1/2 percent reported by PIs. Over time, the percentage of participants with physical handicaps declined from 4.6 percent in 1984 and 5.5 percent in 1986 to a low of 1.9 percent in 1990.

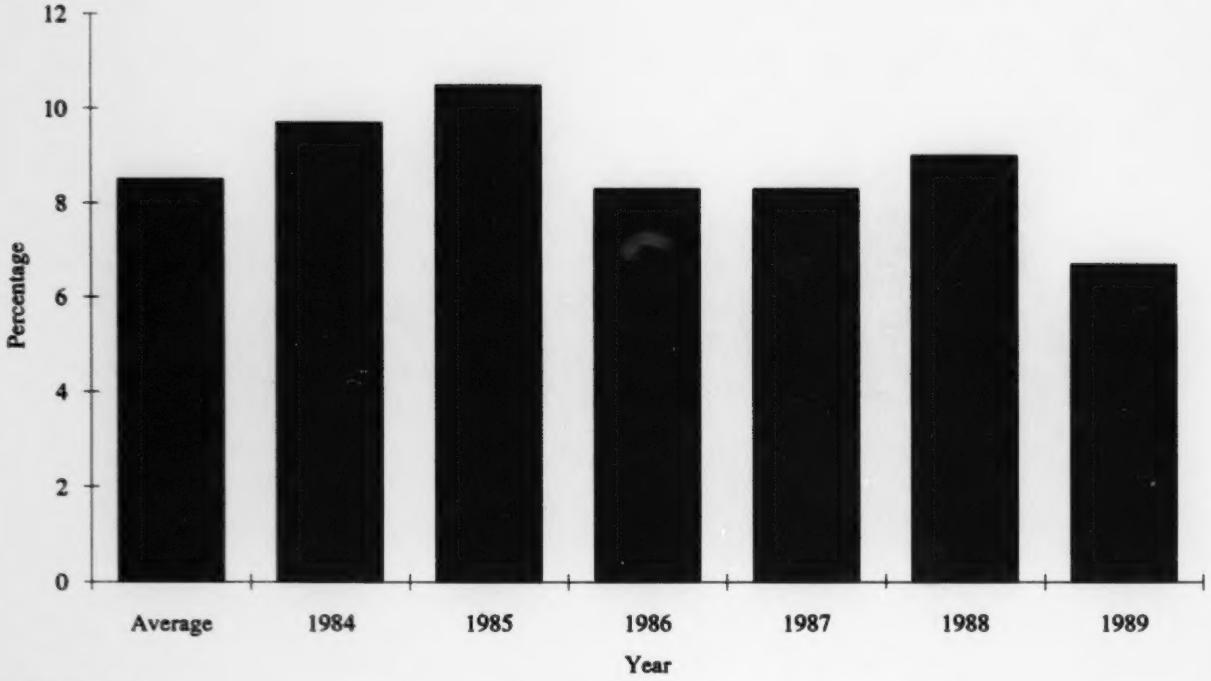
4.7.4 Recruitment of Teachers from Economically Disadvantaged Areas

As seen in Figure 4.26A, PIs reported a general trend toward increased recruiting of teachers from economically disadvantaged areas. The percentage of PIs that reported utilizing special procedures to recruit teachers from economically disadvantaged areas increased from 31.7 percent in 1984 to 48.7 percent in 1989.

The most common procedures used for this recruitment, as seen in Figure 4.26B, are contacting districts with a high proportion of the target group (71.5%), contacting individual teachers (16.3%), and emphasizing teachers from economic disadvantaged areas in the project literature (6.0%).

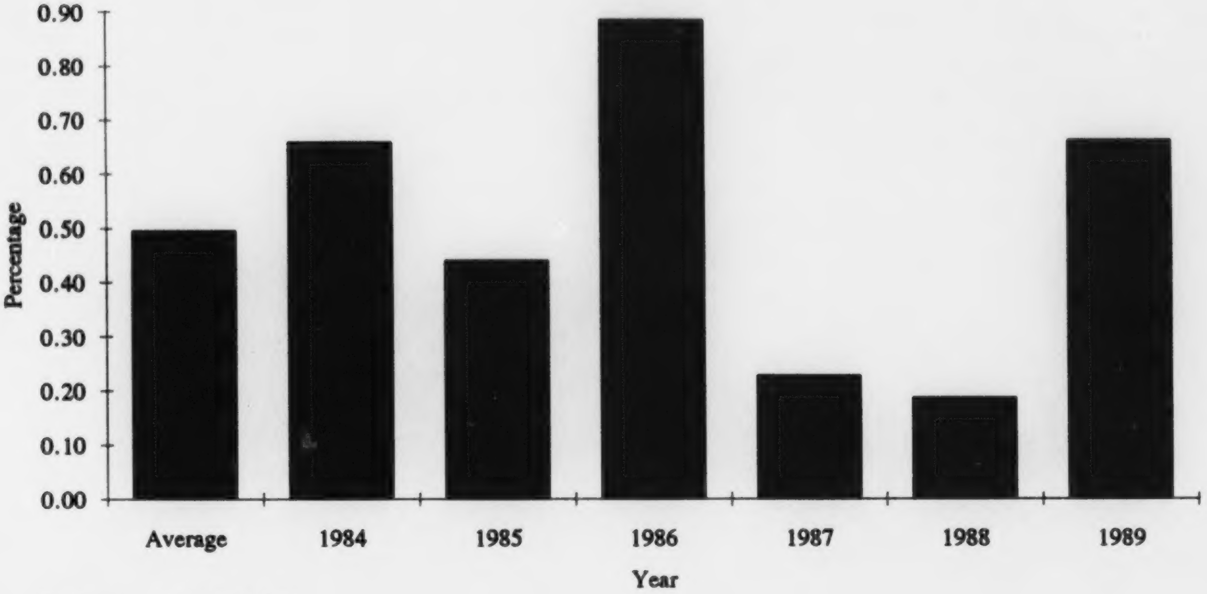
Principal Investigators were also asked to indicate whether their enrollment goals for participants from disadvantaged areas had been met. As seen in Figure 4.27, the percentage of projects that met their enrollment goals for disadvantaged areas, by award year, ranged from a low of 65.2 percent in 1989 to a high of 81 percent in 1985. Aggregated across all years, 74.4 percent of projects met this goal.

Figure 4.23 - Percent PIs Meeting Enrollment Goals for Teachers with Physical Disabilities, by Award Cohort



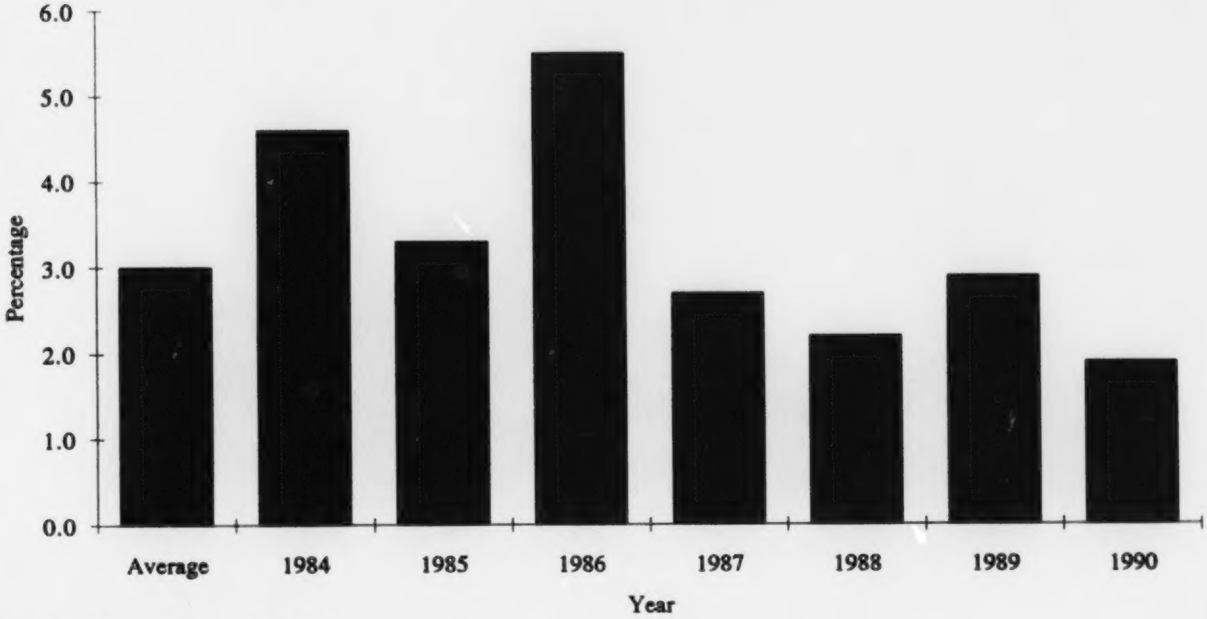
Source: Item 11A

Figure 4.24 - PI Reported Participation of Persons with Physical Disabilities, by Award Cohort



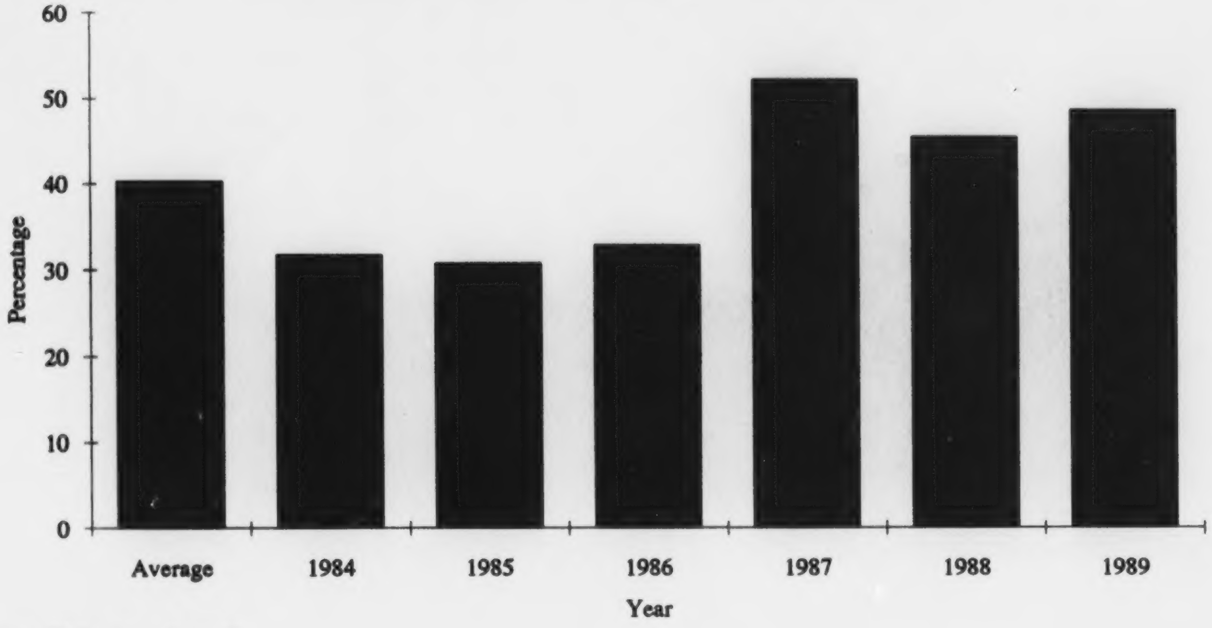
Source: PI Survey - Item 10A (4)

Figure 4.25 - Physical Handicap Status of Participants, by Award Cohort



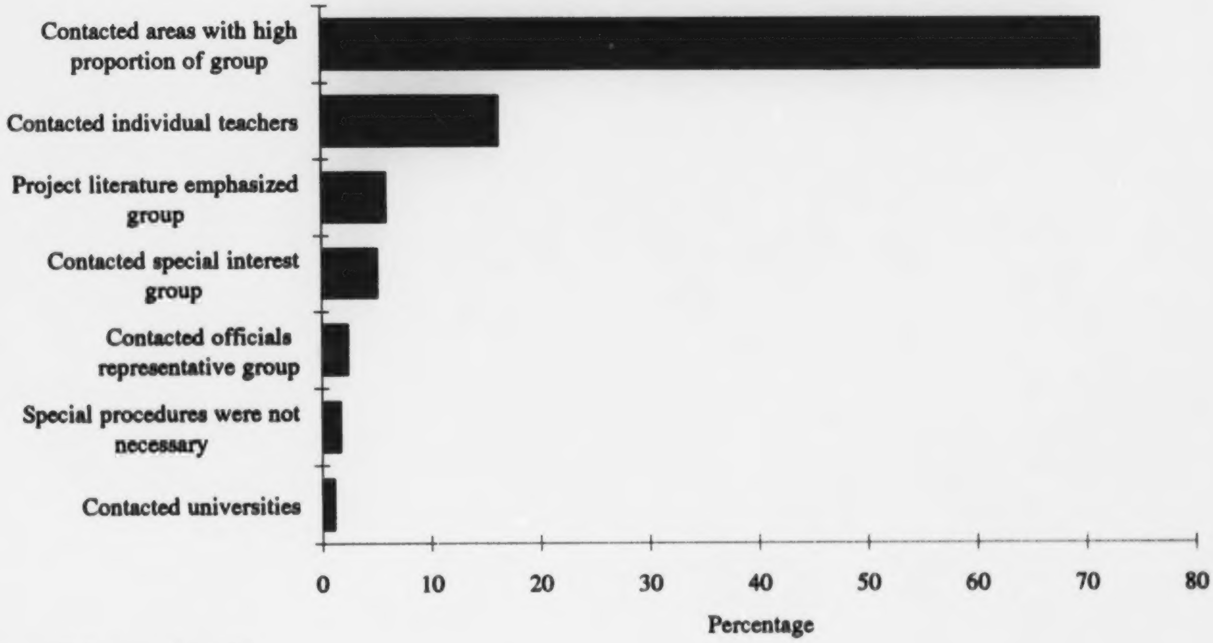
Source: Participant Survey - Item 43

Figure 4.26A - Special Procedures Used to Recruit Teachers from Economically Disadvantaged Areas, by Award Cohort



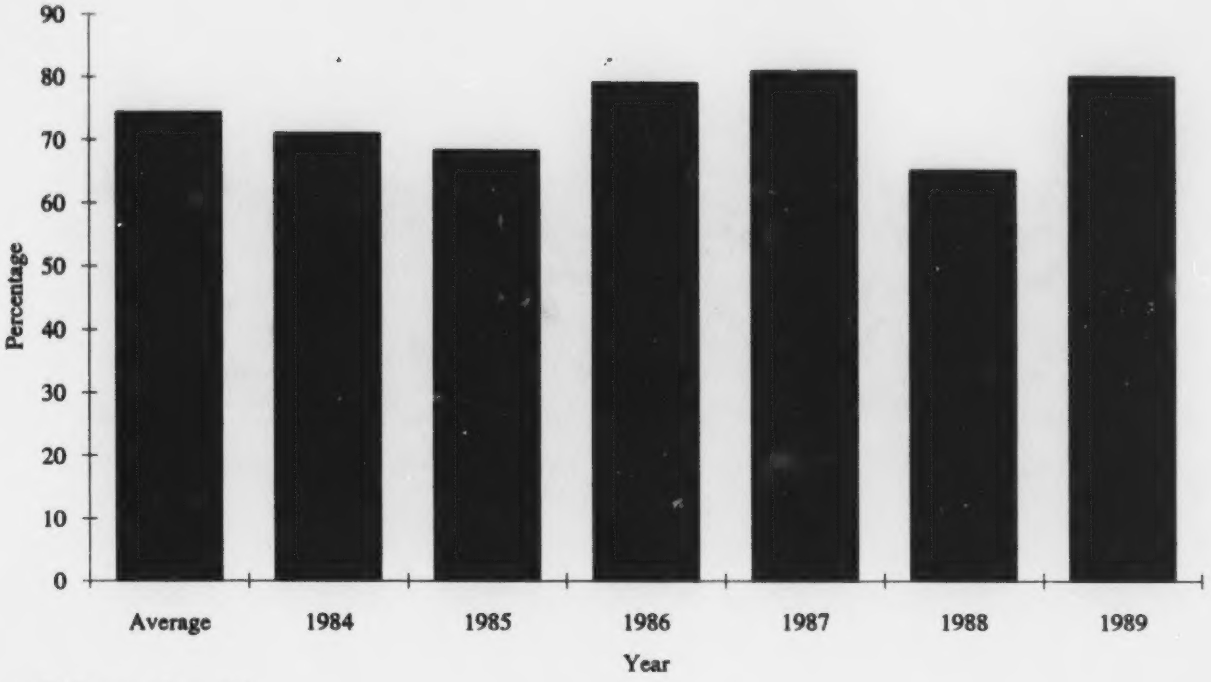
Source: PI Survey - Item 4B

Figure 4.26B - Special Procedures Used to Recruit Teachers from Economically Disadvantaged Areas



Source: PI Survey - Item 4B

Figure 4.27 - Met Enrollment Goals for Teachers from Economically Disadvantaged Areas, by Award Cohort



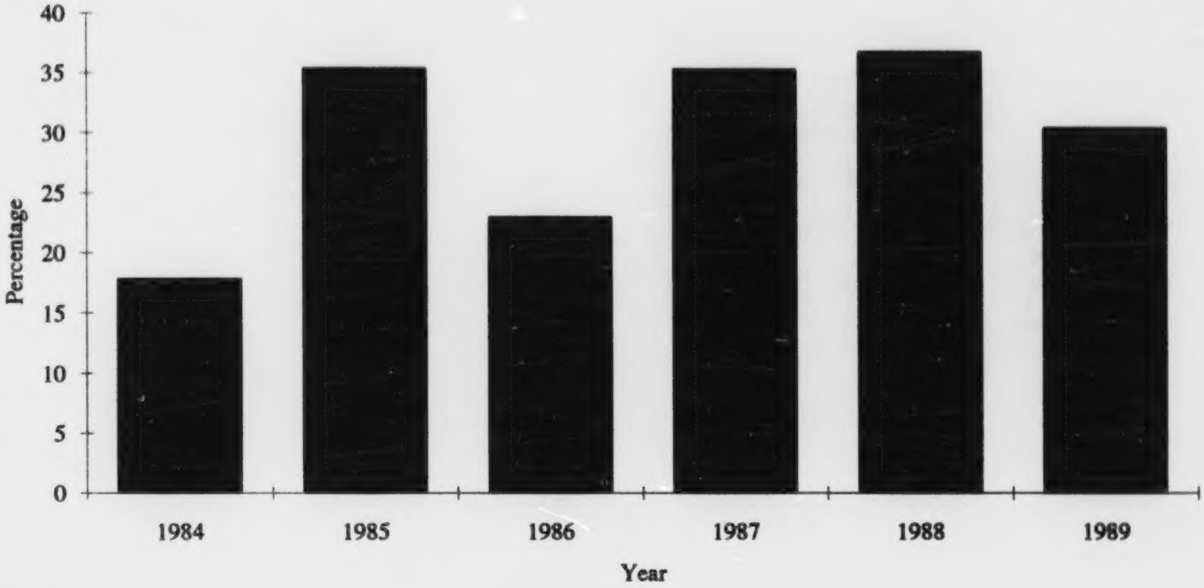
Source: PI Survey - Item 11A

Since 1984, over 15,000 teachers from economically disadvantaged areas have participated in the TEP program. The percentage of teachers from economically disadvantaged areas ranged from a low of 17.8 percent in 1984 to a high of 30.4 percent in 1987 and has generally increased over time.

Most PIs indicated that they were unable to meet their enrollment goals for participants from disadvantaged areas due to the lack of qualified candidates.

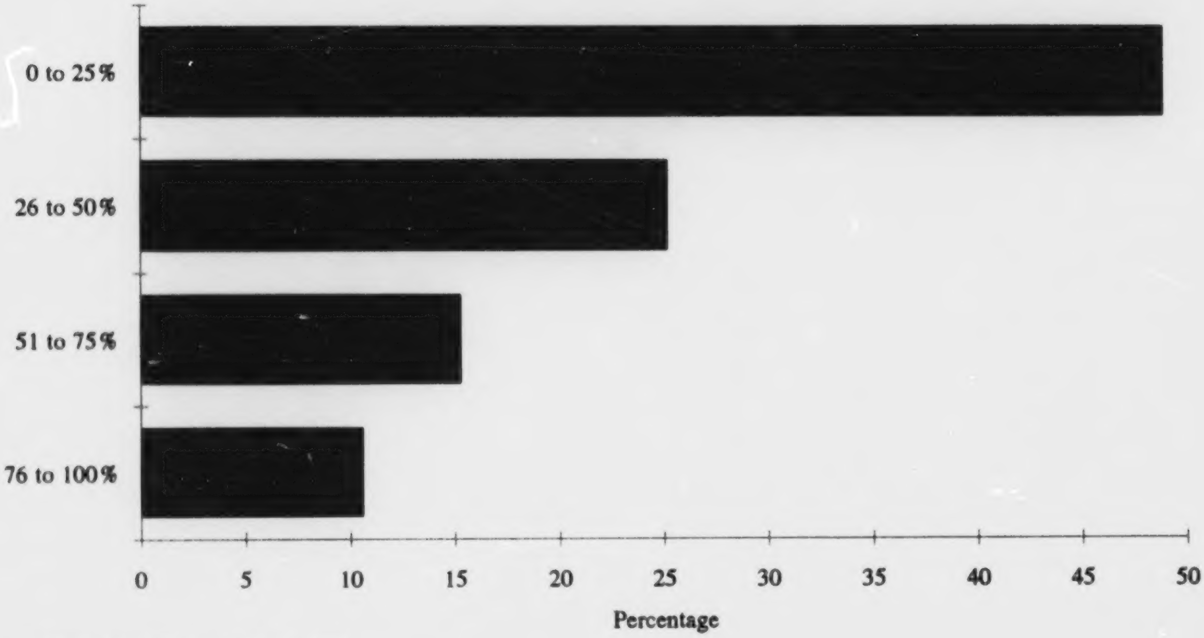
Participants were asked to report upon the number of students in their school district that were eligible for school lunches. As shown in Figure 4.29, 48.9 percent of participants reported that between 0 and 25 percent of students in their districts were eligible for school lunches, thus 51.1 percent of participants were from districts where more than 25 percent of students qualified for the school lunch program.

Figure 4.28 - PI Reported Percentage of TEP Project Participants Reported as Coming from Economically Disadvantaged Communities, by Award Cohort



Source: Item 10A

Figure 4.29 - Participant Reported Percentage of Students Eligible for School Lunches



Source: Participant Survey - Item 27D

5.0 CHARACTERISTICS OF PARTICIPANTS

We begin this chapter with an overview of the number of participants involved in the TEP projects, and the various project sizes that were found. After this, a variety of professional and educational characteristics of participants are documented in this study with respect to their occupational positions, age and experience in teaching, grade levels taught, and type of school in which they taught. In addition, specific information was sought with respect to their academic preparation and major areas of study, and their level of ability in science and mathematics.

5.1 Number of Participants per Award

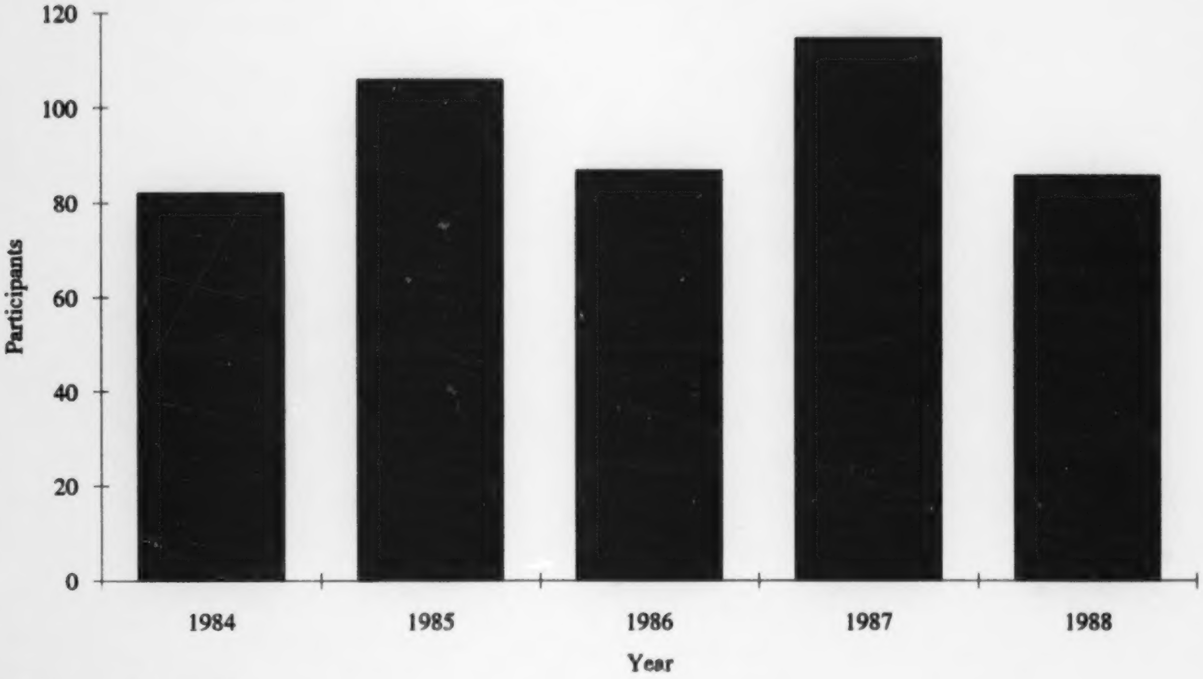
5.1.1 Number of Participants

In terms of total award participation, weighted estimates of total TEP participation indicated that, across all 599 TEP projects, roughly 63,000 participants were served, or an average of 105 participants per project. As seen in Figure 5.1, over time, the median number of new participants served over the lifetime of a project ranged from 82 in 1984 to 115 in 1987.

Inasmuch as both the number of active TEP projects and the average size of projects increased over the first several years of the Program, a majority of these teachers participated during the last several years of the program (see Figure 5.2A). Over time, the total number of participants in TEP projects increased from 2,139 in 1984 to 9,209 in 1989 before decreasing to 6,109 in 1990.

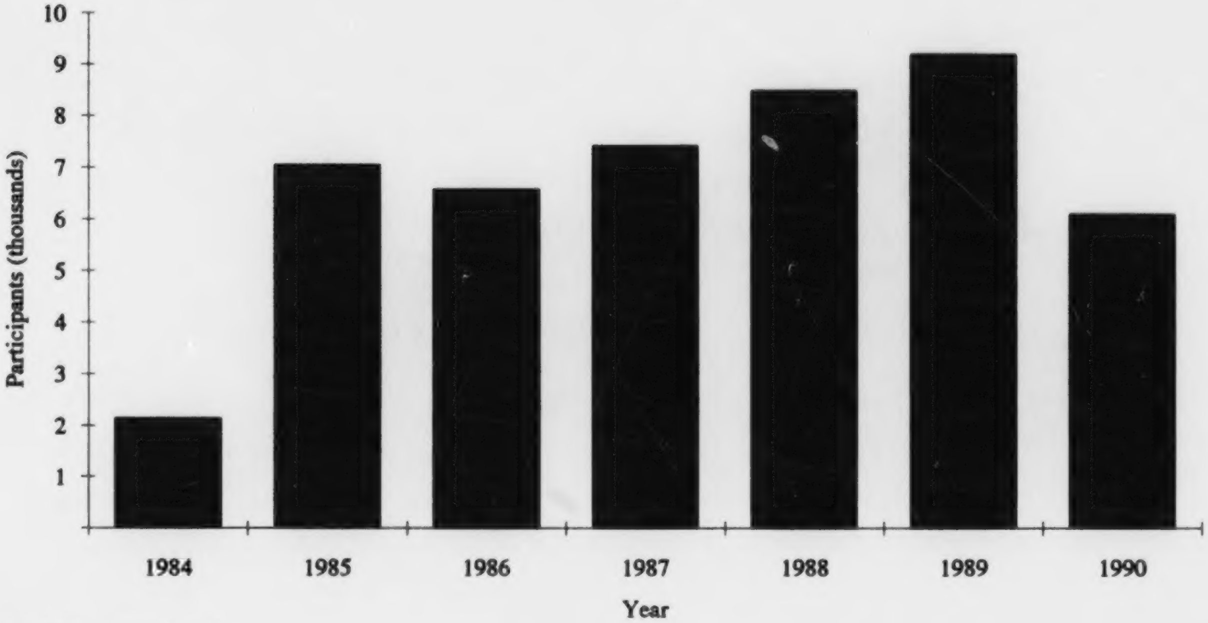
Examination of the data revealed that there was considerable variation in the size of TEP projects. As shown in Figure 5.2B, the greatest percentage of TEP participants (46%) took part in medium sized projects with between 35 and 99 participants; 32 percent of participants were in TEP projects with between 5 and 34 participants and the remaining 22 percent took part in large TEP projects with more than 100 participants.

Figure 5.1 - Median Total Number of New Participants Over the Life of the TEP Project, by Award Cohort



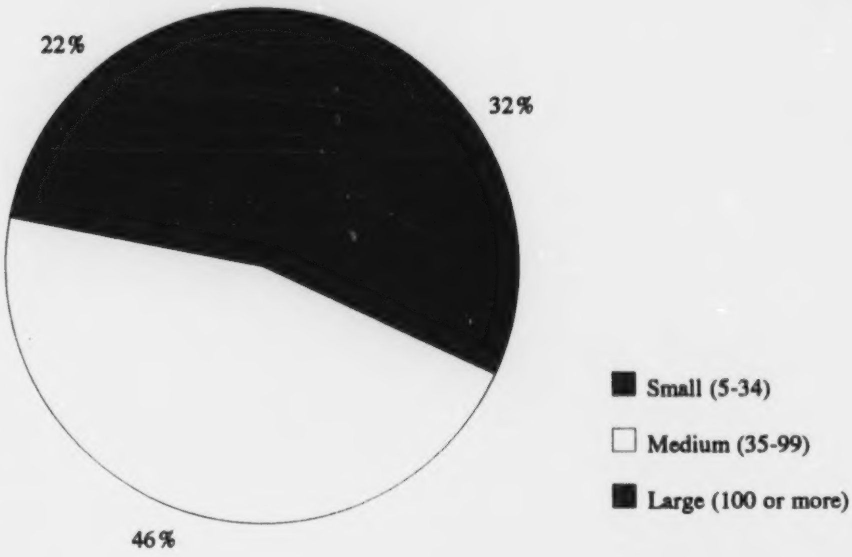
Source: PI Survey - Item 9

Figure 5.2A - Total Number of Participants in TEP Projects, by Award Cohort



Source: PI Survey - Item 9

Figure 5.2B - Proportion of Small, Medium, and Large Participation Levels, by Award Cohort



Source: PI Survey - Item 9

Another way of considering this question is with respect to the relative number of new participants over the life of a project, i.e., during years 1, 2, and 3, respectively. The median annual number of new participants did not fluctuate greatly over the life of a project. During the first year, the median number across years was 31 new participants (with a high of 36 in 1987 and a low of 29 in 1988). The median number of new participants in year two was also 31, also with little variability across years. Year three of the TEP projects had a median number of 33 participants, and was the most variable (ranging from a low median of 22 among FY1984 projects to a high median of 49 among 1987 projects).

5.2 Employment as Teachers, Years of Experience and Current position

5.2.1 Teaching at Time of Enrollment

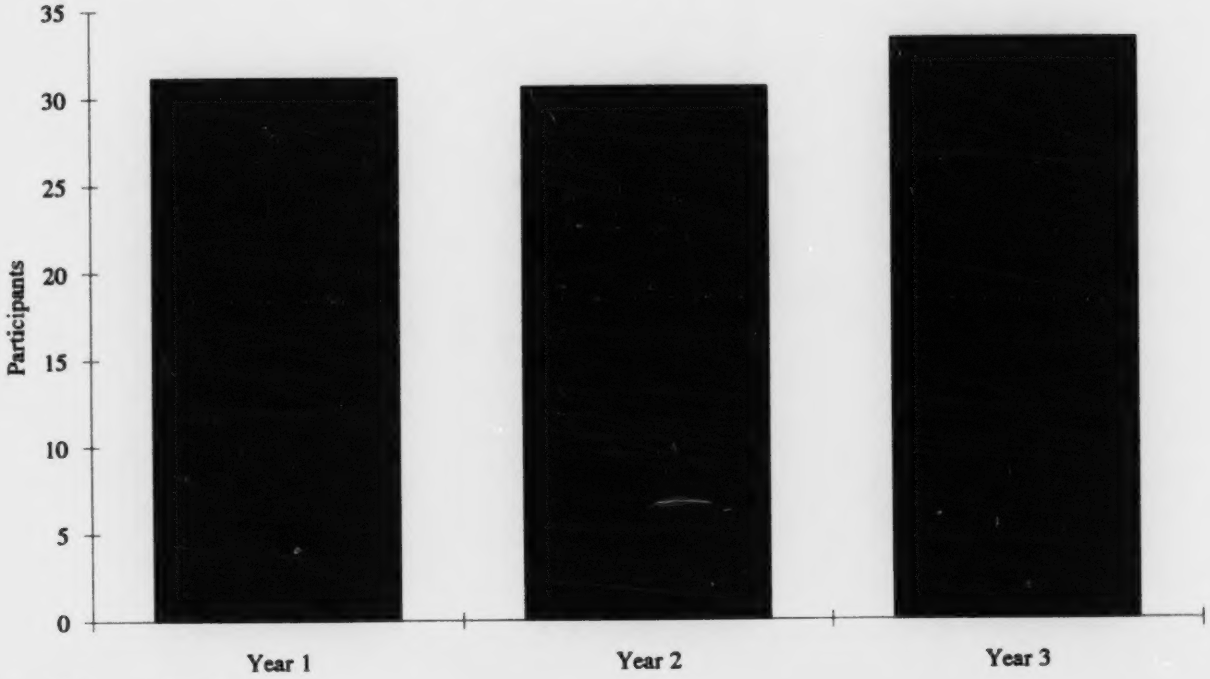
At the time of enrollment, 98.3 percent of TEP participants reported that they were employed as teachers. As shown in Figure 5.4, over time the percentage of TEP participants that were employed as teachers was consistently high, ranging from 96.9 percent in 1988 to 100 percent in 1985.

5.2.2 Age

According to PIs, as seen in Figure 5.5A, the largest percentage of participants in TEP projects (41%) were between 31 and 40 years of age. Participants between 41 and 50 years of age, according to PIs, made up 31 percent of participants, while participants under 30 years old and over 50 made up 16 percent and 10 percent respectively.

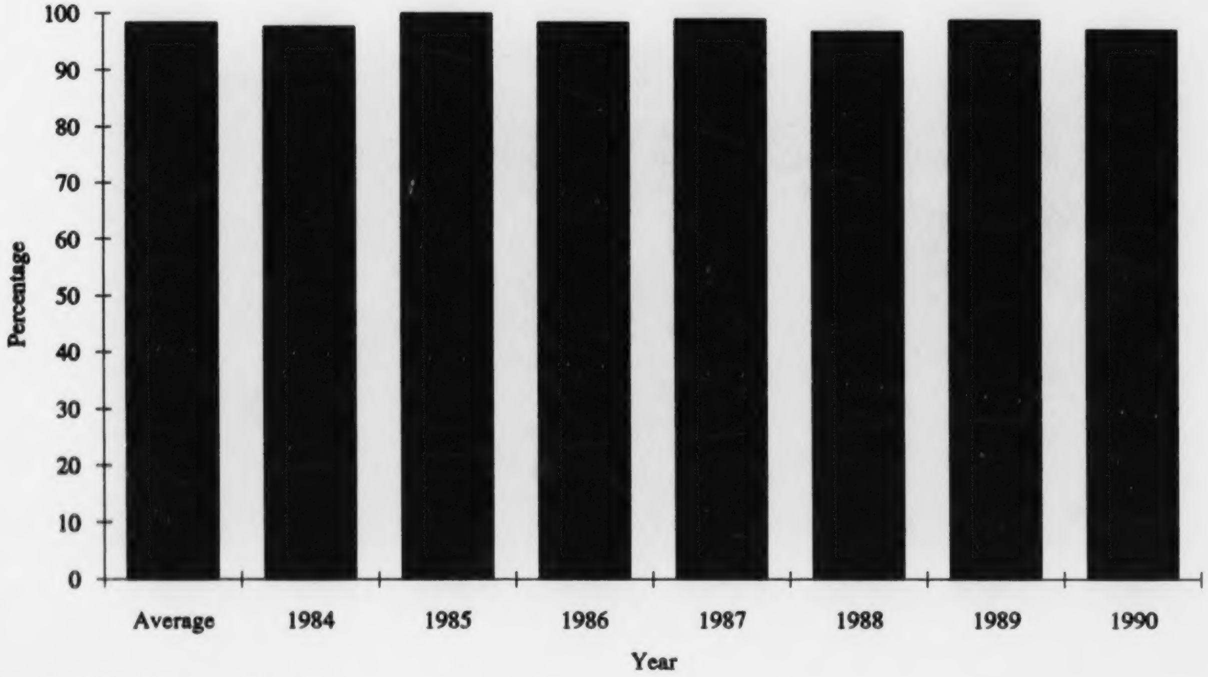
Data on participant's age were also gathered from the participants themselves. As shown in Figure 5.5B, TEP participant generally identified themselves as being older than reported by the Principal Investigators. The largest percentage of participants in TEP projects (47%) were between 41 and 50 years old and an additional 25 percent reported that they were over 50 years of age. Younger participants, those 40 years of age or younger, comprised 28 percent of participants.

Figure 5.3 - Average Annual Number of New TEP Participants, Years 1, 2, and 3 of Project



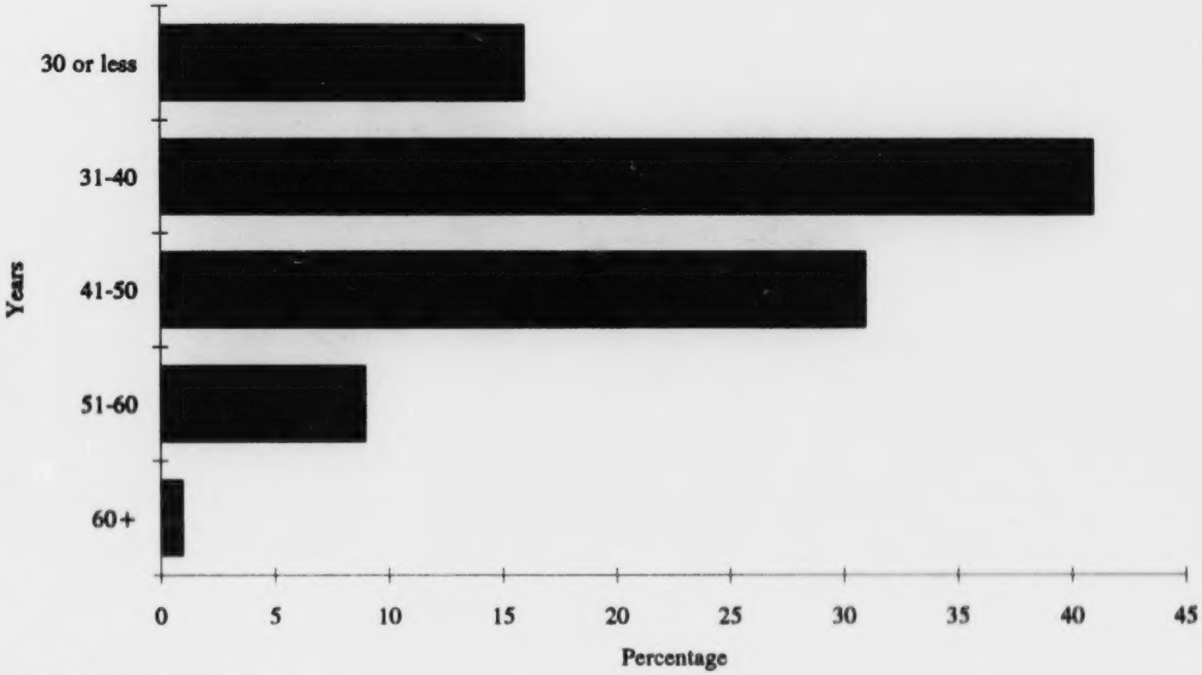
Source: PI Survey - Item 9

Figure 5.4 - Percentage Employed as Teachers at Time of TEP Enrollment, by Award Cohort



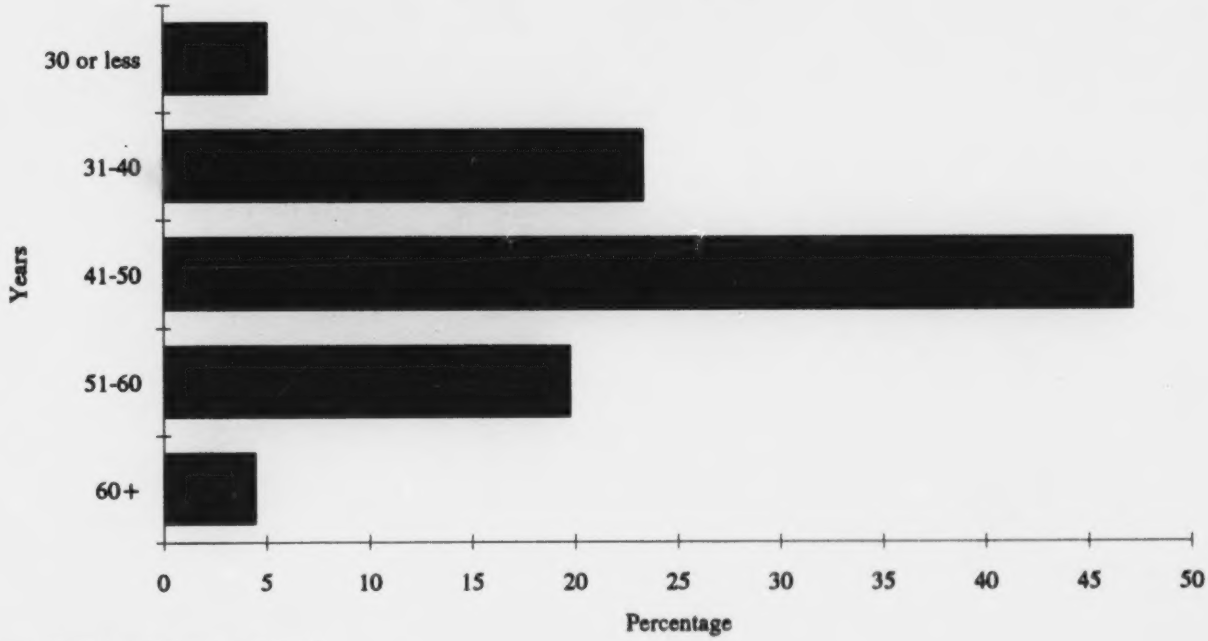
Source: Participant Survey - Item 13

Figure 5.5A - PI Reports: Percent of Participants by Age Group



Source: PI Survey - Item 10B

Figure 5.5B - Participant Reports: Percent of Participants by Age Group



Source: Participant Survey - Item 44

In terms of average age of participants, PIs estimated that the greatest percentage of participants were between 31 and 40 years of age. As seen in Figure 5.6A, over time the PIs reported little fluctuation in the average age of participants. The actual average age of participants, as seen in Figure 5.6B, was 45.1 years old. Over time, the average age of participants dropped slightly from 47.5 years in 1984 to 43.8 years in 1990.

5.2.3 Teaching Experience

Participants reported, on average, 14.5 years of experience as teachers (see Figure 5.7). Over time, the teaching experience of TEP participants ranged from 13 years in 1988 to 16 years in 1985.

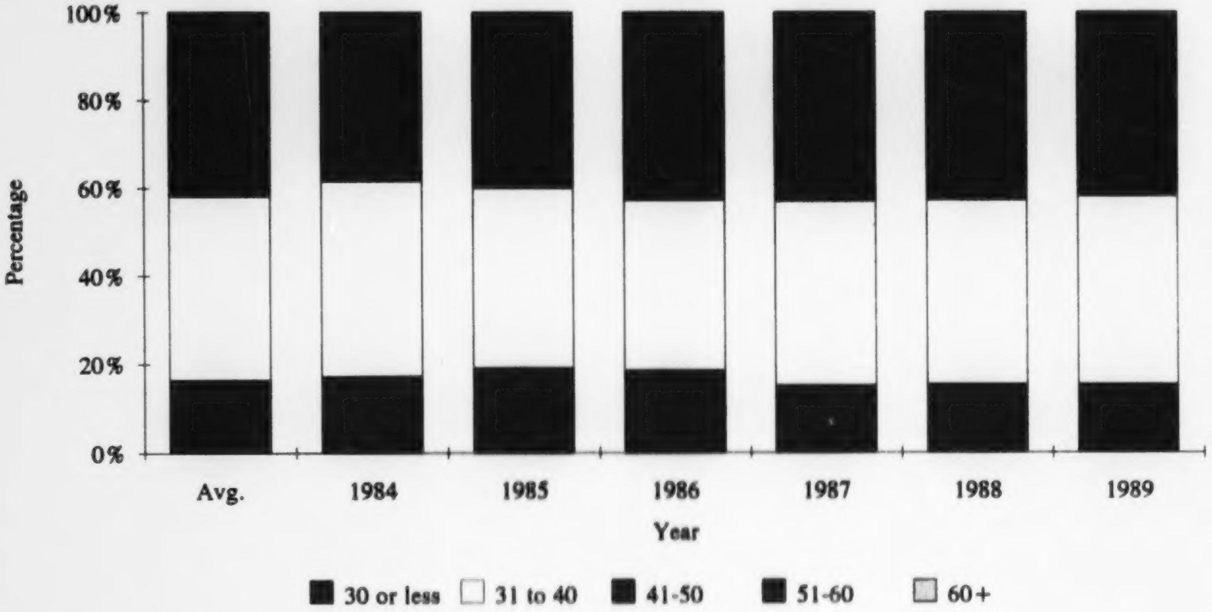
5.2.4 School Affiliation (K-12) of Participants

PIs were asked to identify the level of school taught by participants in their projects. As shown in Figure 5.8A, according to PIs, the largest percentage of participants (43%) taught senior high school students; elementary school and middle/junior high teachers comprised 30 percent and 23 percent of all TEP participants, respectively. PIs reported that, over time, the percentage of TEP participants who are elementary or middle/junior high school teachers has increased relative to the number of high school teachers.

Participants surveyed also provided data on the level of school taught. As seen in Figure 5.8B, there was some discrepancies between data provided by PIs and by participants. Data provided by both PIs and by participants were in agreement that the largest percentage of participants taught at the senior high school level. However, while more than half of participants (56 %) reported teaching at this level, PIs had estimated that 43 percent did so.

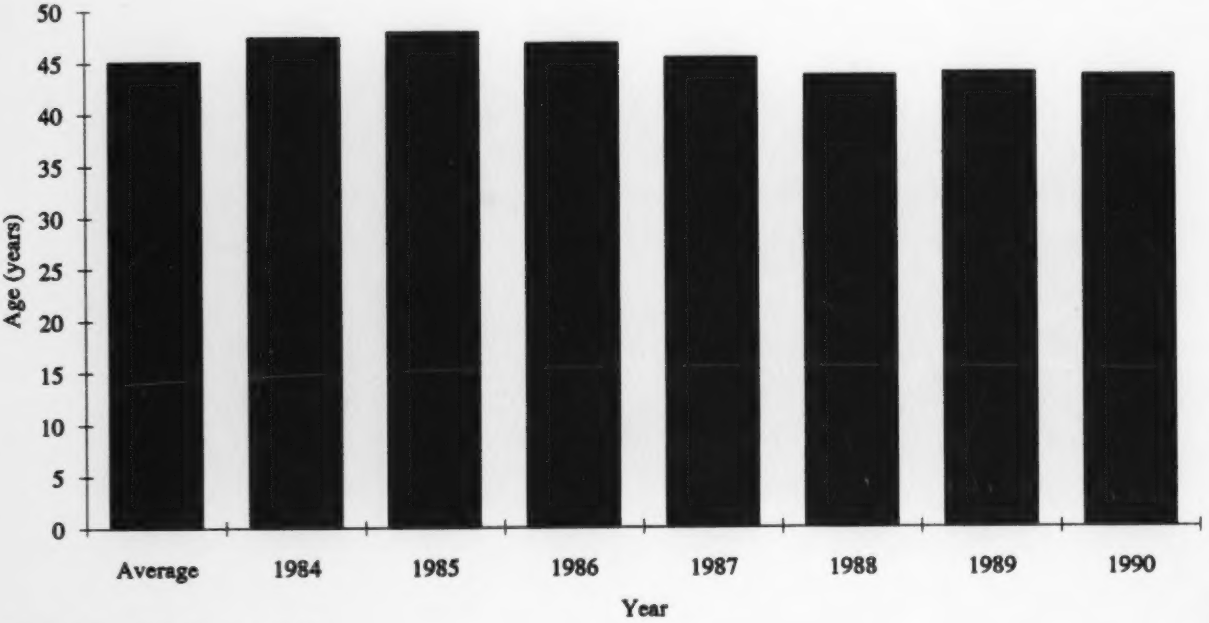
Some discrepancies also existed on the percentages reported for the other school levels as well. Among participants, 17 percent reported teaching at the middle/junior high school level (versus the 30 percent reported by PIs), and 18 percent reported teaching at the elementary school level (versus the 23 percent figure reported by the PIs). The remainder were teaching in Kindergarten.

Figure 5.6A - PI Estimated Average Age Distribution of TEP Projects, by Award Cohort



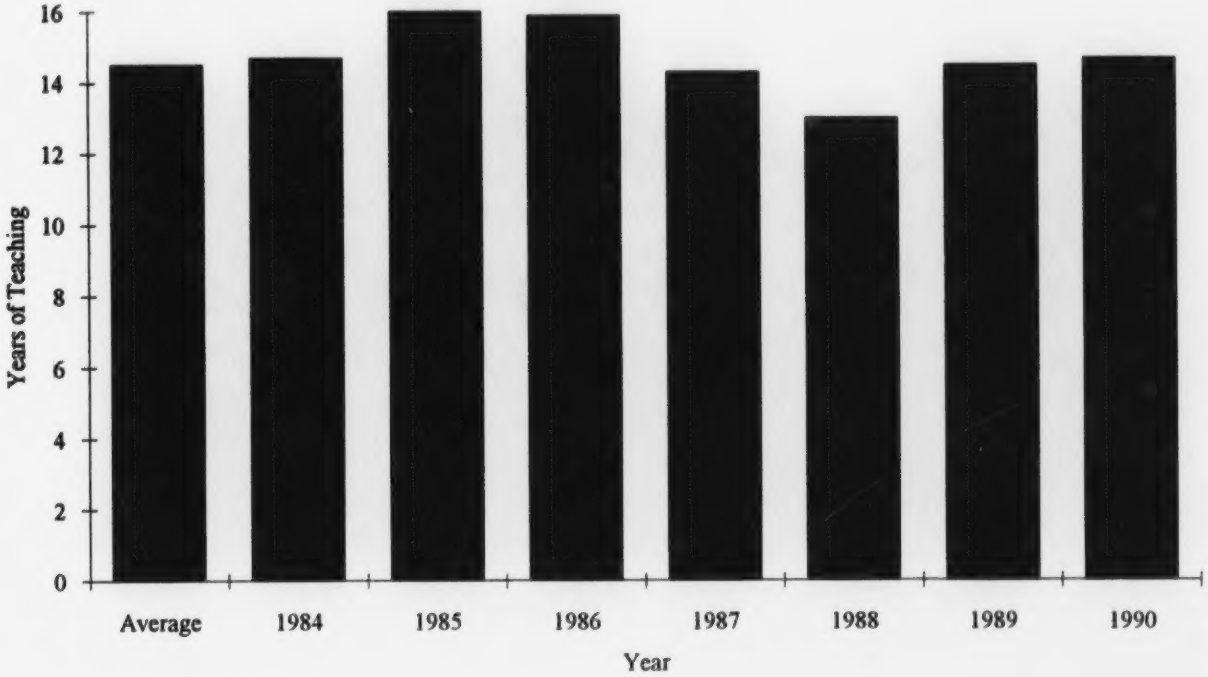
Source: PI Survey - Item 10B

Figure 5.6B - Actual Age Distribution of Participants, by Award Cohort



Source: Participant Survey - Item 44

Figure 5.7 - Average Years Teaching Experience at Time of TEP Enrollment, by Award Cohort



Source: Participant Survey - Item 14

Figure 5.8A - PI Report on Average Grade Level Taught by TEP Project Participants

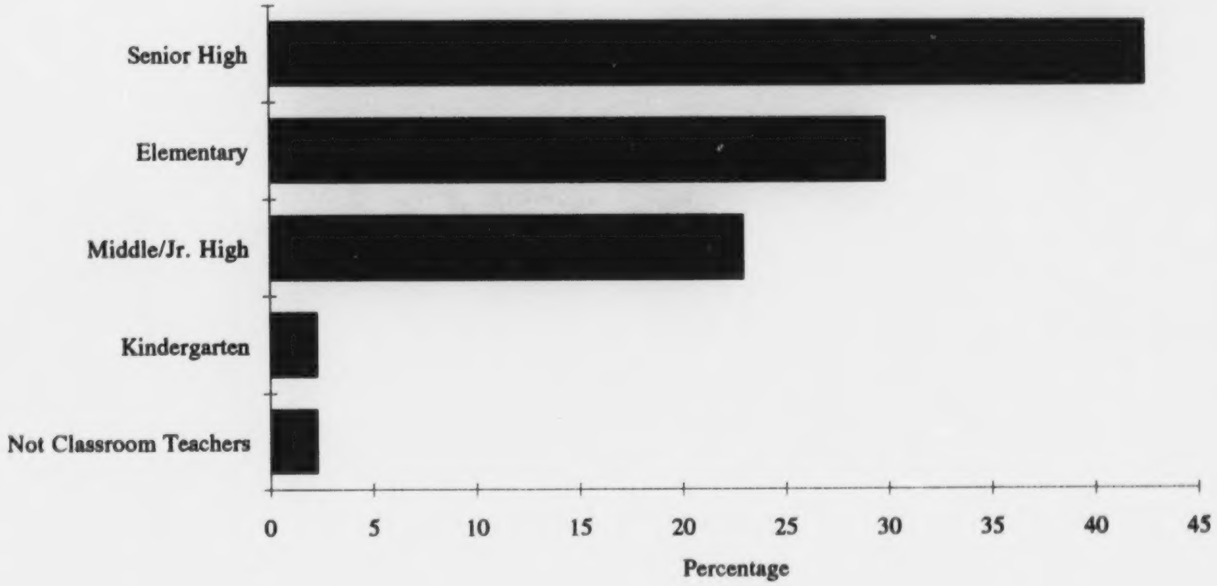
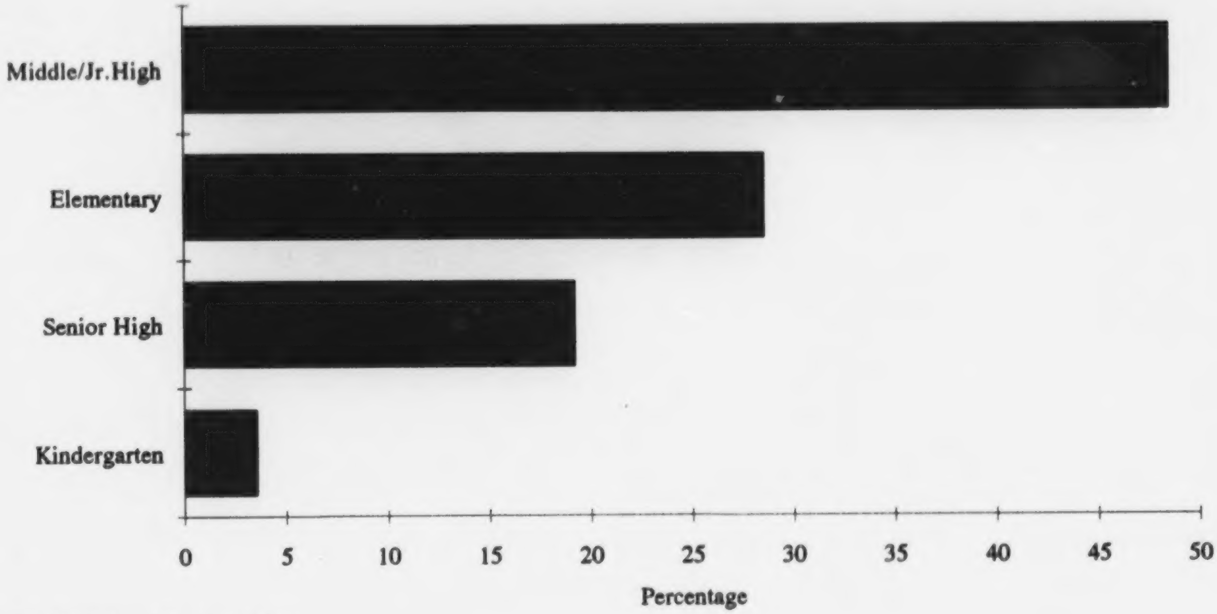


Figure 5.8B - Participants Report on Average Grade Level Taught by TEP Project Participants, by Award Cohort



Source: Participant Survey - Item

5.2.5 Geographic Distribution of Participants

When asked about the geographic distributions of their participants, PIs indicated that the majority of participants (53%) came from districts within the PI's locality and that an additional 27 percent came from other districts within the PI's state (see Figure 5.9). Over time, there has been a small increase in the percentage of participants coming to TEP projects from other regions of the U.S.

5.2.6 Characteristics of Participants' School Districts

In terms of school district location, as shown in Figure 5.10, a roughly equal percentage of participants taught urban (34.5%), suburban (33.8%), and rural (31.7%) school districts. The distribution of participants from urban, suburban, and rural locations has become more equal over time; in 1984, 51.6 percent of all participants were from suburban school districts and only 19.0 percent were from school districts in rural areas, in 1990 urban teachers comprised 39.8 percent, suburban teachers accounted for 32.5 percent, and 27.7 percent of all participants were from rural districts.

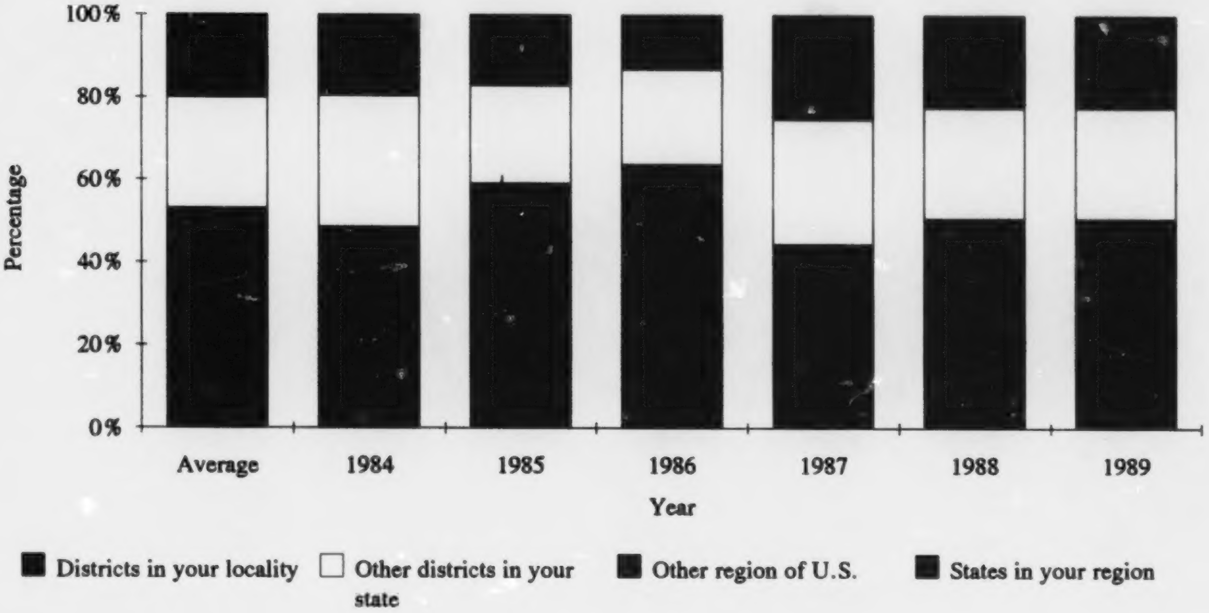
The great majority of all TEP participants (92.2%), as seen in Figure 5.11, are teachers in public school districts; the remaining 7.8 percent teach in private schools. Over time the percentage of TEP participants from private schools has increased steadily from 5.5 percent in 1984 to 11.3 percent in 1990.

5.3 Participant Science and Mathematics Education

5.3.1 Highest Degree Held and Field of Study

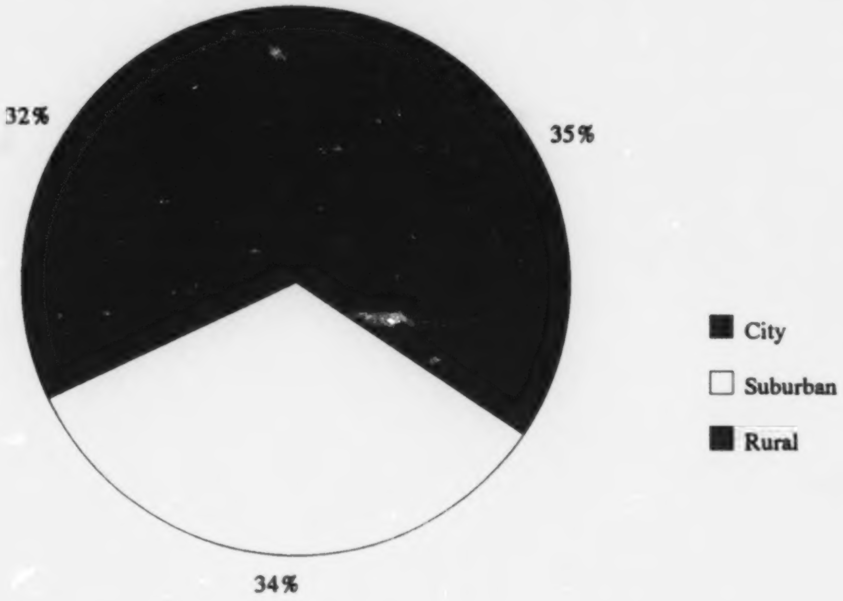
Participants were asked to indicate all degrees that they held. As shown in Figure 5.13, 53.4 percent of all participants hold a Bachelor's of Arts/Sciences, 45.8 percent have a Master's Degree in Education, 27.4 percent have a Master's of Arts/Sciences, and 26.1 percent hold Bachelor's in Education degrees. Over time, the breakdown of degrees held by participants remained generally even although the percentage of participants with Bachelor's in Arts/Sciences did increase from 48.5 percent in 1984 to 57.3 percent in 1990.

Figure 5.9 - Geographic Location of Project Participants' School Districts, by Award Cohort



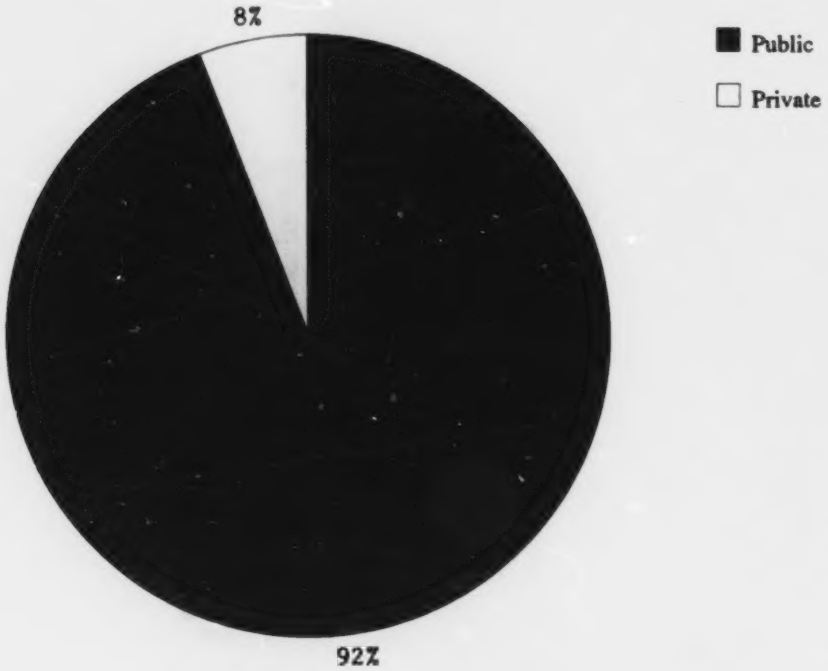
Source: PI Survey - Item 8

Figure 5.10 - Location of Participants' School Districts



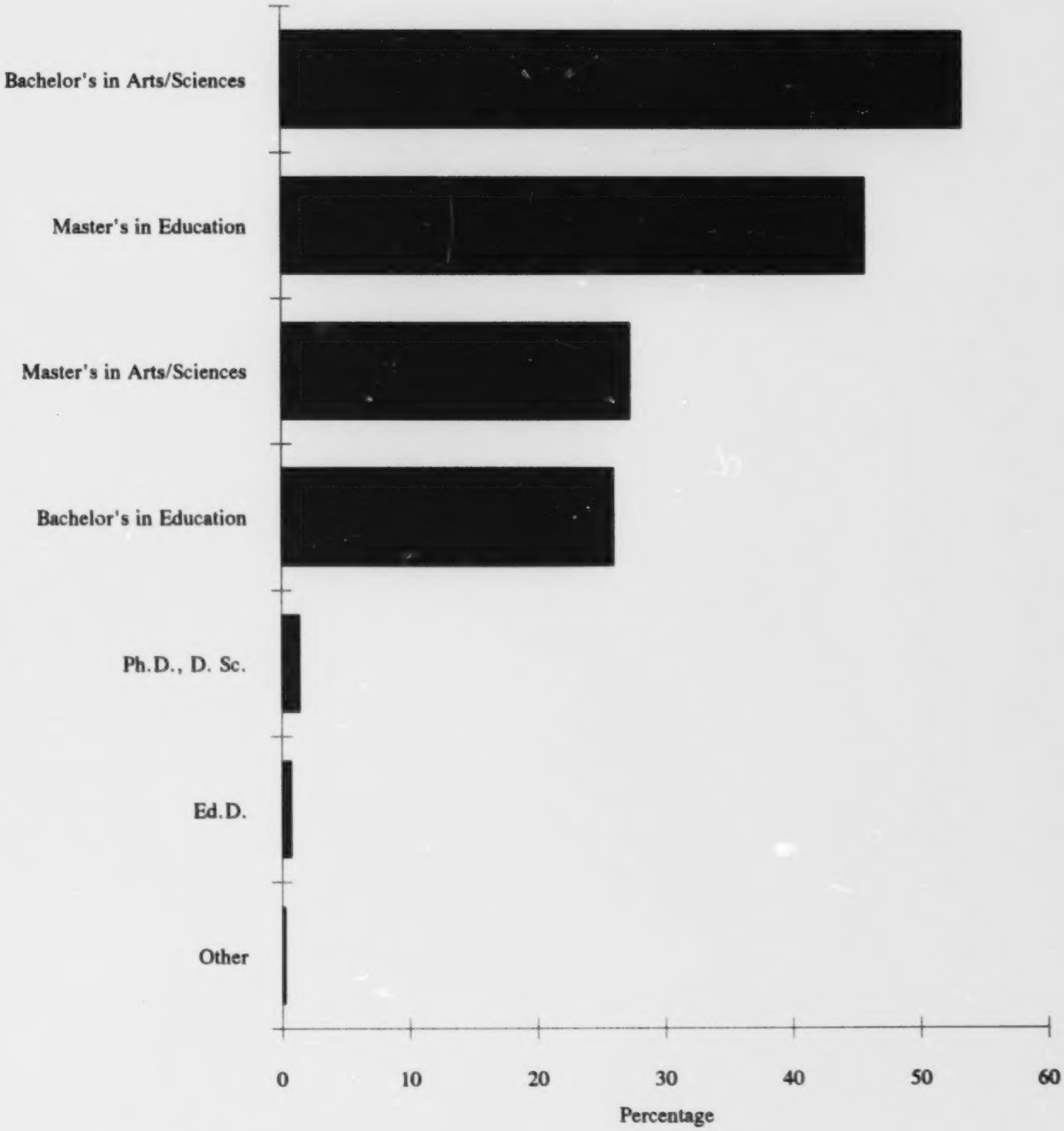
Source: Participant Survey - Item 8A

Figure 5.11 - Participants' School Districts



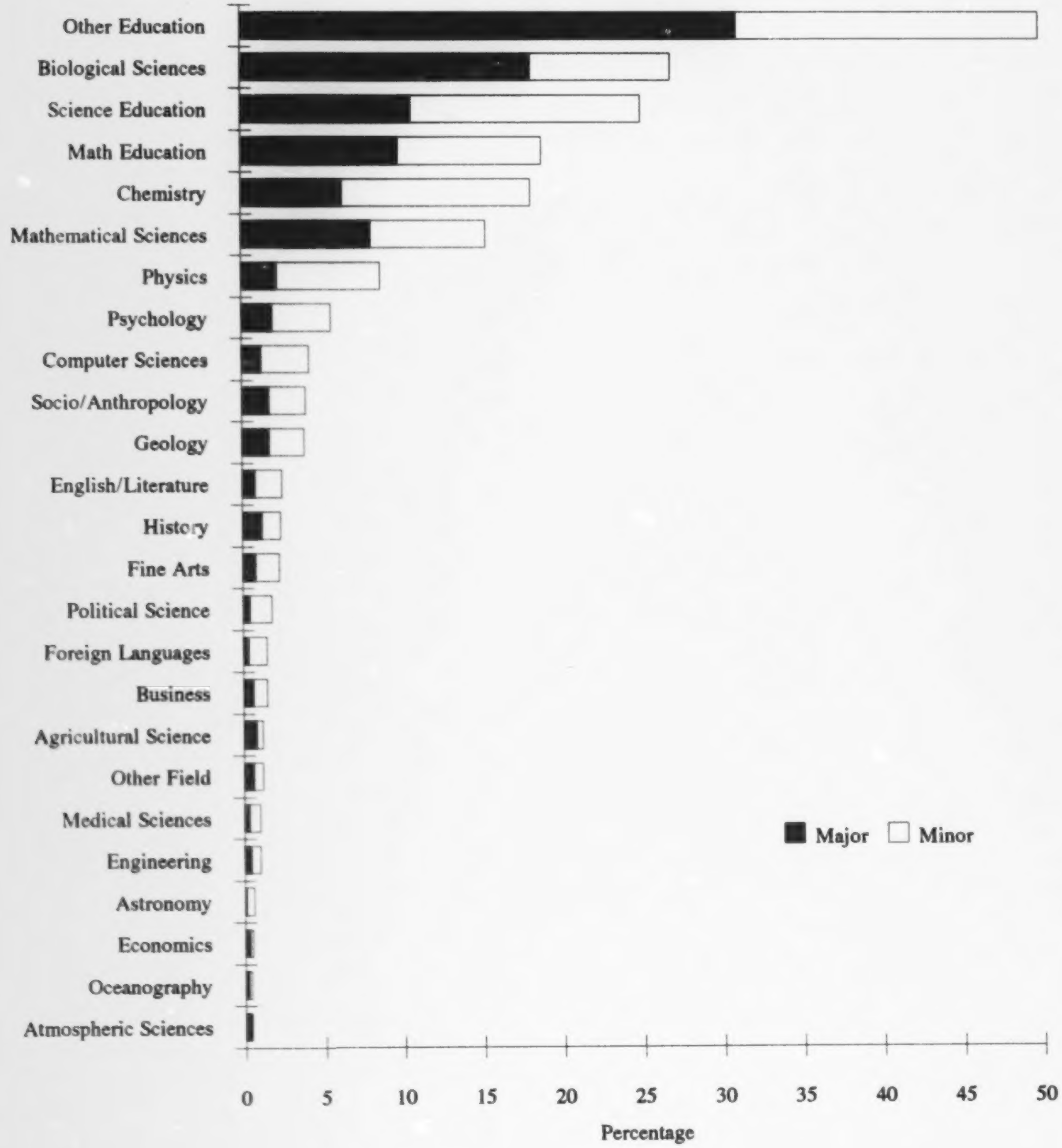
Source: Participant Survey - Item 8B

Figure 5.12 - Incidence of Bachelors, Masters, Doctorates, and Other Degrees



Source: Participant Survey - Item 39

Figure 5.13 - Percentage Reporting Major and Minor Fields of Study



Source: Participant Survey - Item 40

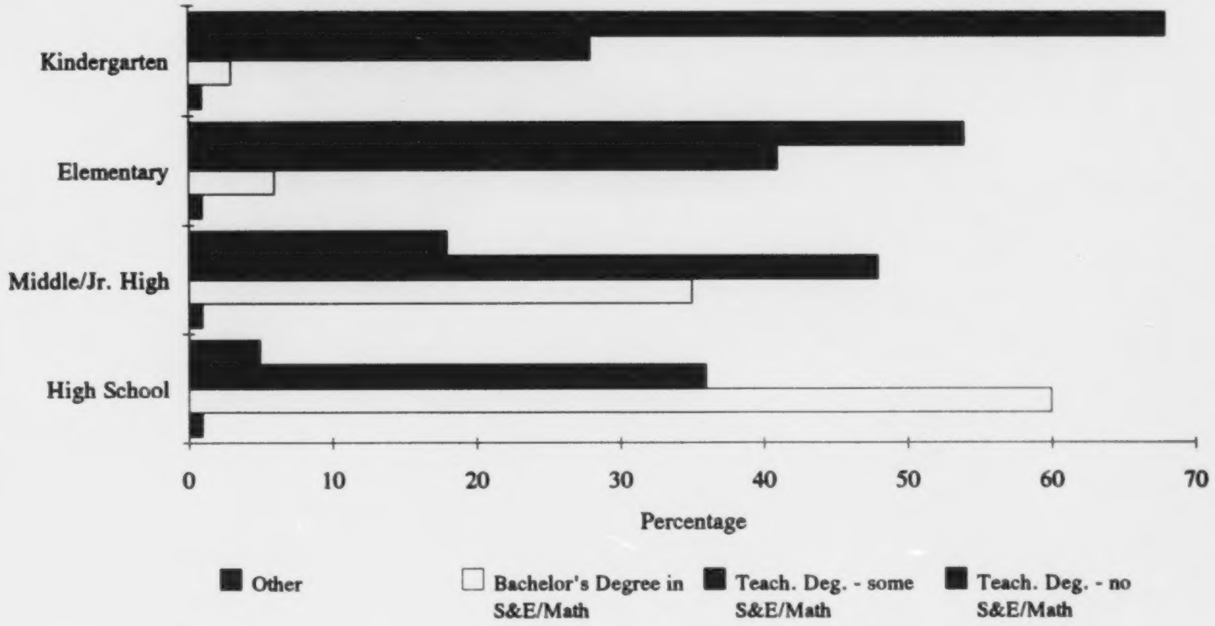
Participants were also to specify, for the highest degree earned, both their major and minor fields of study. As shown in Figure 5.13, the most often cited major fields of study for participants were education (31.0%), the biological sciences (18.1%), science education (10.6%), and mathematics education (9.8%). The most common minor fields of study cited by TEP participants include education (18.9%), science education (14.4%), and chemistry (11.8%). Over time, the percentage of participants majoring in biological science dropped slightly while a greater percentage of participants earned their highest degrees in education.

5.3.2 Scientific Preparation of Participants

Two aspects of participant familiarity with science and mathematics subject matter were explored: formal training and grasp of subject matter. Based upon PI estimates, the percentage of participants with bachelor's degrees (or higher) in a field of science, engineering, or mathematics increased dramatically with grade level (see Figure 5.14). PIs estimate that only three percent of participants teaching at the kindergarten level hold bachelor's degrees in science, math, or engineering; by contrast, they believed that 60 percent of all senior high school participants hold relevant bachelor's degrees. PIs estimate that the majority of kindergarten and elementary teachers, 68 percent and 54 percent respectively, held teaching degrees and have had little or no formal science or mathematics training. The largest percentage of middle school/junior high teachers (48%) had teaching degrees with some undergraduate courses in science, engineering, or mathematics.

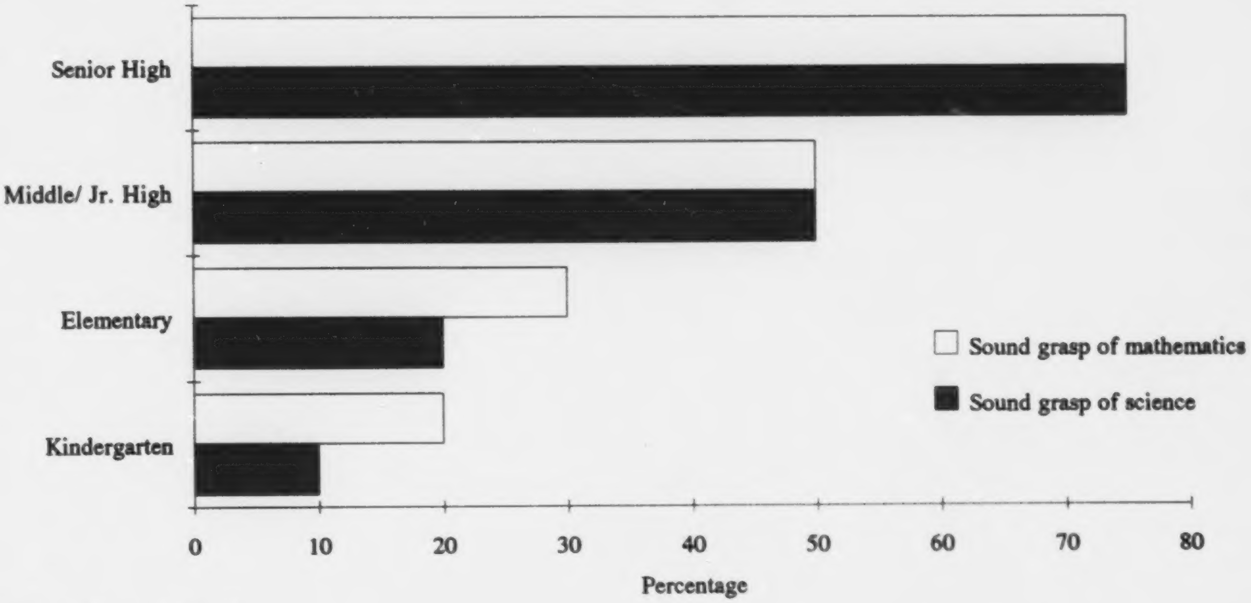
Second, with respect to PIs' assessments of the percentage of their participants having a sound grasp of science and mathematics subject matter, as seen in Figure 5.15, participants teaching at higher grade levels were judged by PIs to have a better grasp of the subject matter than teachers from the lower grade levels. For example, PIs reported that only 20 percent of kindergarten level teachers had a sound grasp of the scientific subject matter upon entering the project, compared with 67 percent of high school teachers. For mathematical subject matter, PIs assess that 32 percent of kindergarten teachers and 69 percent of high school teachers had a sound grasp of the subject matter when entering the project.

Figure 5.14 - PI Estimate of the Level of Formal Training in Science and Mathematics Among Participants, by Level of School Taught



Source: PI Survey - Item 12

Figure 5.15 - PI Assessments of the Percent of Participants in TEP Having a Sound Grasp of Science and Mathematics Subject Matter, by Level of School Taught



Source: PI Survey - Item 13

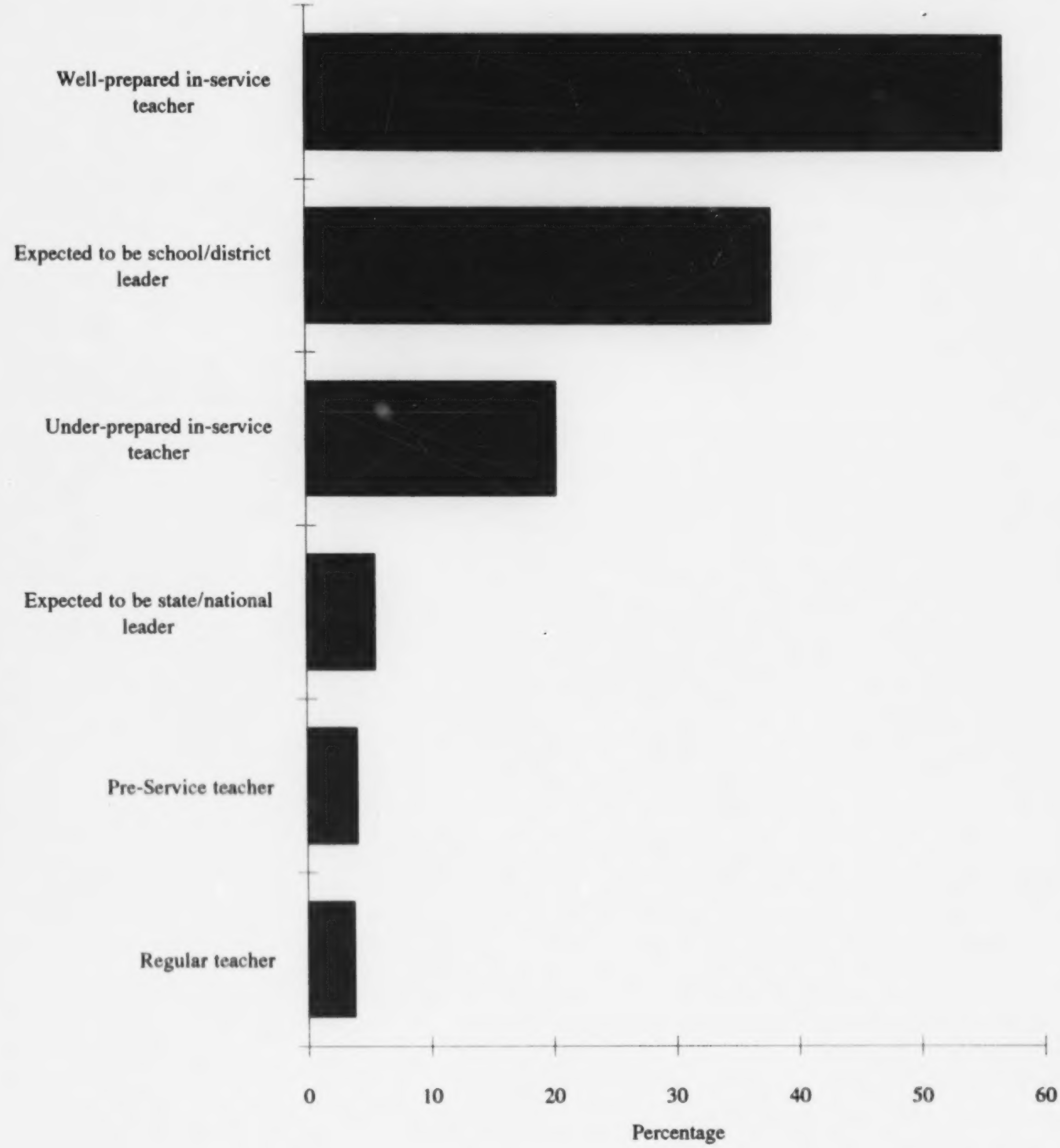
5.3.3 Assessed Level of Teaching Abilities

As shown in Figure 5.16, the majority (56.9%) of participants considered themselves to be well-prepared in-service teachers, while 38.0 percent said that they expected to assume leadership roles in their school districts and 20.4 percent described themselves as under-prepared inservice teachers. Over time however, there has been a general trend of more participants characterizing themselves as under-prepared in-service teachers and fewer participants characterizing themselves as well-prepared.

5.3.4 Proportion of Time Teaching Science and Mathematics

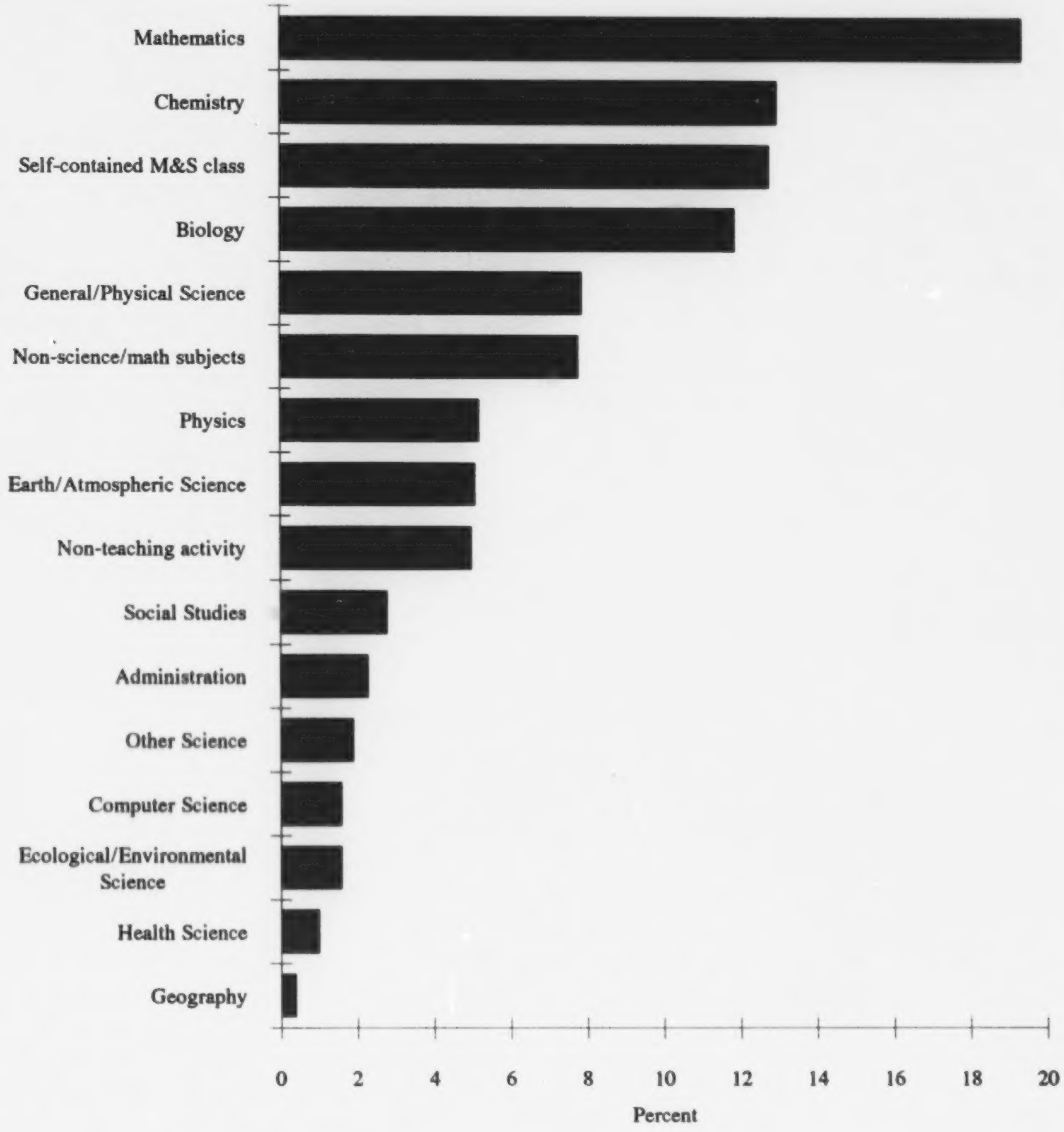
As shown in Figure 5.17, during a typical work week TEP participants spend the largest proportion of their time teaching mathematics (18.6%), chemistry (12.9%), teaching in a self-contained math and science class (14.9%), and biology (11.2%). On average, participants also spend 6.8 percent of their time teaching non-science or math subjects, 4.3 percent of their time on non-teaching activities, and 2.2 percent of their time taking care of administrative responsibilities. Over time, the general trend indicates that participants are spending more time teaching mathematics and slightly less time teaching biology and general physical science.

Figure 5.16 - Self-Reported Level of Teaching Ability



Source: Participant Survey - Item 17

Figure 5.17 - Proportion of Time Spent Teaching Various Science and Mathematics Courses



Source: Participant Survey - Item 16

PART THREE

PROJECT GOALS, OBJECTIVES, AND OPERATION

6.0 GOALS AND OBJECTIVES FOR THE TEP PROJECTS

6.1 *Goals and Objectives for Participation*

Three sets of goals and objectives that PIs might be expected to have for their participants were explored in this study: subject matter understanding, pedagogical practice, and general professional development. Specific objectives were rated on a five point scale from "4", meaning very important, to "0" meaning not a goal. PIs were also asked to identify the three goals that were most strongly emphasized by their projects.

6.1.1 *PI Goals and Objectives for Projects*

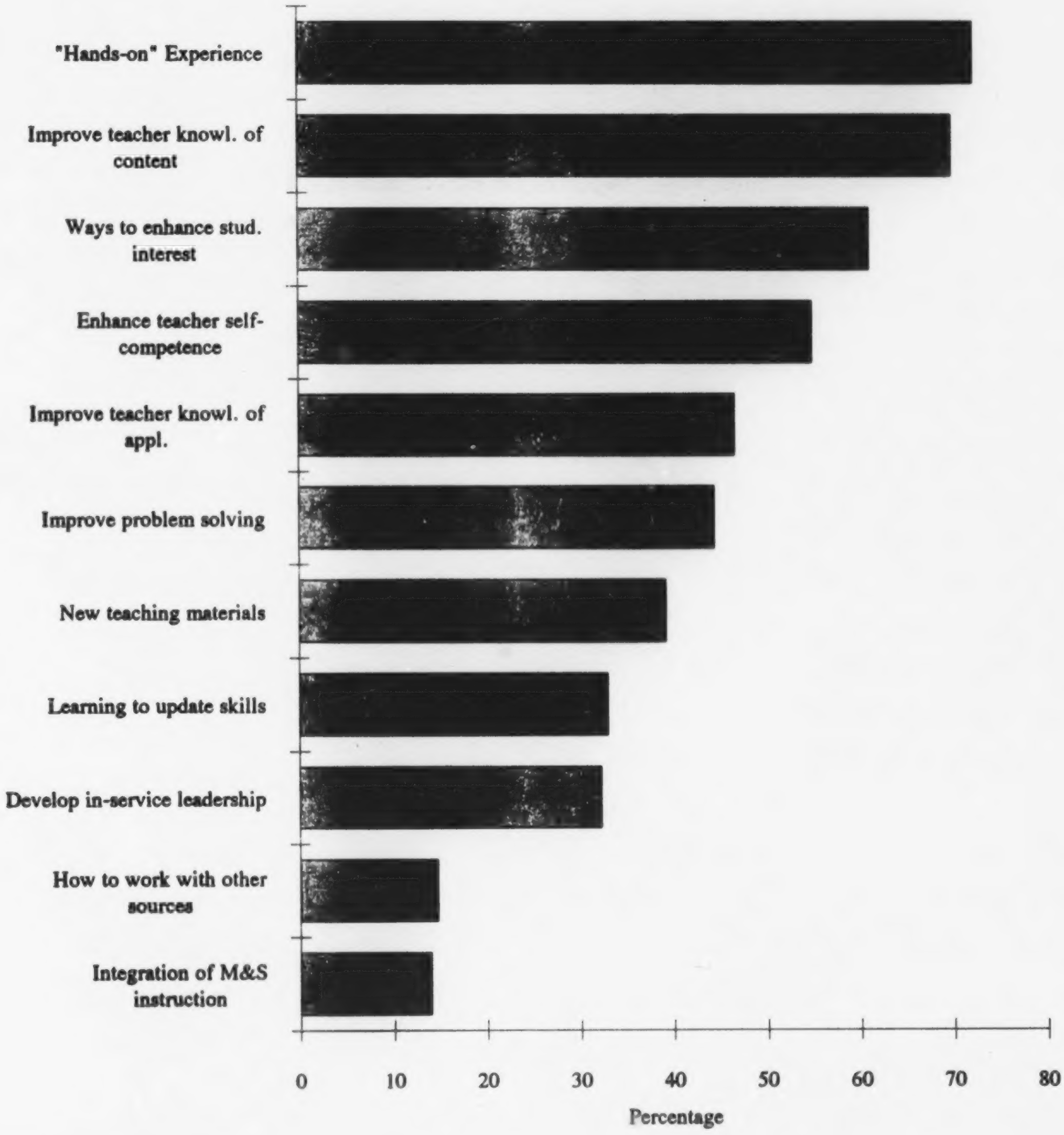
As seen in Figure 6.1A, the goals with the highest ratings, cited by 50 percent or more of PIs, were giving participants experience with hands-on activities, improving teacher-specific knowledge of science or mathematics content, developing ways for teachers to enhance student interest in science or mathematics, and enhancing teachers sense of self-competence.

Over the years, the development of teacher skills for improving student problem-solving and critical thinking abilities, and the development of methods to enhance student interest in science or mathematics have become more central goals for TEP projects. The percentage of PIs who cited the development of skills for improving students' problem-solving and critical thinking abilities as a major goal of the program increased from 27.4 percent in 1984 to 50.8 percent in 1989; similarly, the percentage of PIs citing the development of ways for teachers to enhance student interest in math and science as a major goal increased from 43.5 percent in 1984 to 60.8 percent in 1989.

6.1.2 *Participants Goals and Objectives for Projects*

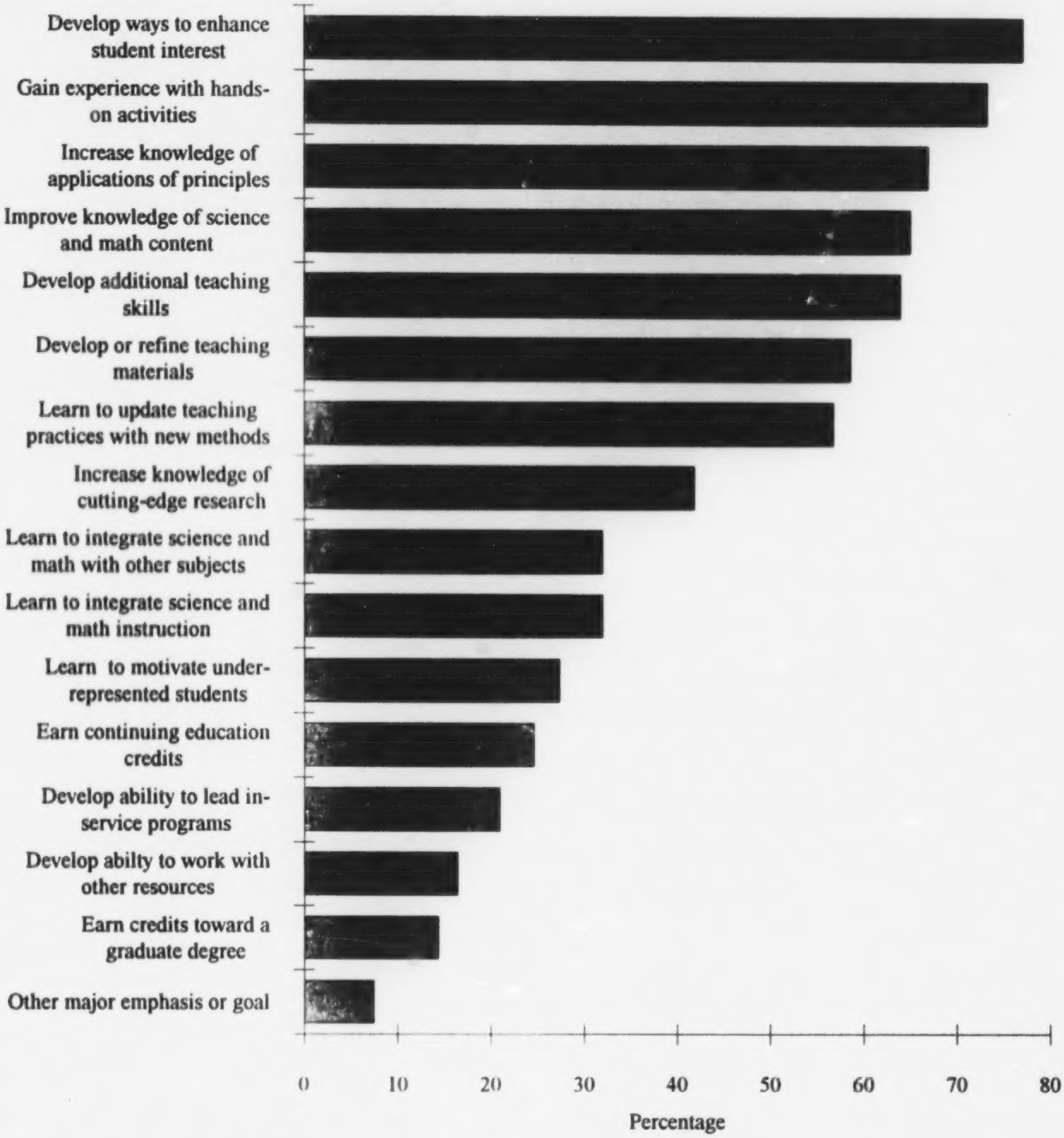
Participants were also asked about their own goals and objectives for their projects. As shown in Figure 6.1B, the participants and PIs stressed the importance of many of the same goals. The objectives cited most often by participants include developing ways to enhance

Figure 6.1A - Major Goals for Participants
(Percentage of PIs Rating Goal as a 'Major Goal')



Source: PI Survey - Item 1A

Figure 6.1B - Average Participant Ratings of Goals and Objectives for their Projects



Source: Participant Survey - Item 2A

student interest in mathematics and science (77.2%), gaining experience with hands-on activities (73.3%), increasing their own knowledge of how to apply math and science principles (67.0%), and improving their knowledge of math and science content (65.1%). Participant ratings of the different objectives, over time, did not fluctuate greatly.

6.2 Priorities

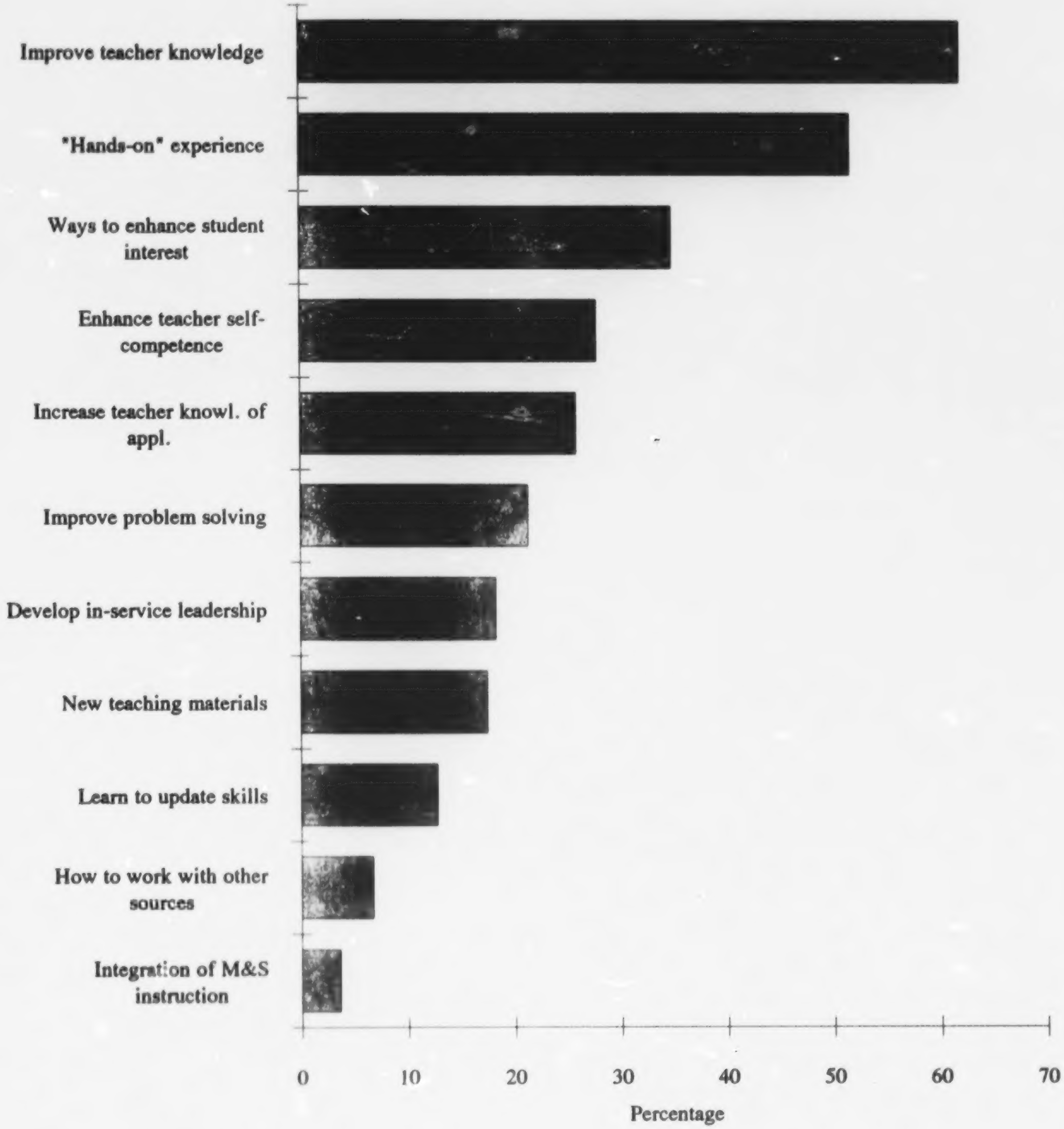
6.2.1 PIs' Priorities

Since a great many goals and objectives were asked about, PIs were also asked to identify those goals that they identified as among the three most important goals. As shown in Figure 6.2A, the most important goals reported by PIs were improving teacher knowledge (62.0%), giving teachers experience with "hands-on activities" (51.7%), and teaching participants ways to enhance their students' interest in math and science (34.9%). Over the years, the percentage of PIs citing the development of ways for teachers to integrate science and mathematics instruction as one of their three major goals declined from 21.0 percent in 1984 to 11.0 percent in 1989.

6.2.2 Participants' Priorities

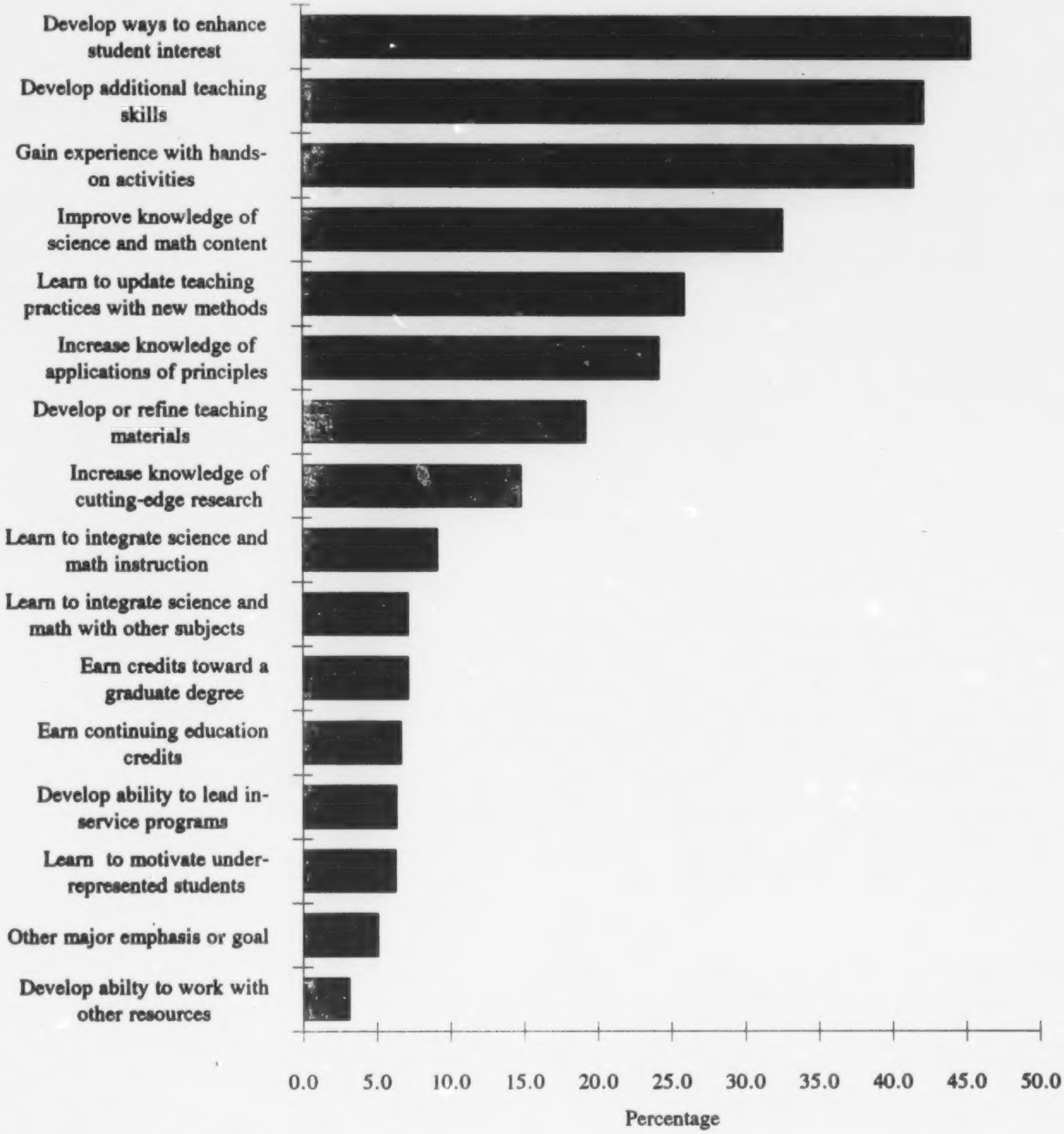
When participants were asked about the three most important objectives, as shown in Figure 6.2B, they cited many of the same goals as the PIs. The objectives reported most often by participants include developing ways to enhance student interest in science and mathematics (45.5%), developing additional teaching skills (42.3%), and gaining experience with hands-on activities (41.6%). What differed between the two groups was the relative emphasis placed on these goals. Whereas PIs stressed subject matter knowledge and hands-on methods, teachers focused more on enhancing student interest levels in science and mathematics, and the development of additional teaching skills. Over time, the percentage of participants citing experience with hands-on activities and ways to enhance students interest in math and science increased.

Figure 6.2A - Highest Rated Goals and Objectives (Percentage of PIs Rating Goal as 1st, 2nd, or 3rd)



Source: PI Survey - Item 1B

Figure 6.2B - Participants' Highested Rated Goals and Objectives (Percentage of PIs Rating Goal as 1st, 2nd, or 3rd)



Source: Participant Survey - Item 2A

6.3 PIs Organizational Development Goals and Objectives

Those organizational objectives rated most highly by PIs were addressing specific local or regional problems or needs for science and mathematics education (46.6%) and performing an evaluation of the project's effects upon participants' substantive knowledge and teaching behaviors (27.5%). The utilization of local in-kind or financial support (12.5%) and increasing collaboration among scientists or mathematicians and education specialists at the host institution (15.6%) were the least important project organizational objectives.

Over time, PIs reported a greater number of considerations as major goals of their projects. Securing support for teachers after their return to the classroom and the evaluation of the project's effects upon participants were considered increasingly important by PIs over time. By contrast, over time the relative importance of increasing collaboration among scientists or mathematicians and education specialists at host institutions decreased.

7.0 GENERAL PROJECT OPERATIONS

A broad range of characteristics were explored with respect to project operations. Among these were the period of operation, the amount of resources available, the types of components available through each project, the areas and grade levels of science and mathematics inservice training provided, instructional methods used, and the development and/or dissemination of curricula materials. Data were gathered both from PIs and from Participants and the findings presented in this chapter.

7.1 *Years of Operation*

PIs provided data on years of operation of their projects. The median duration of a TEP project is 30 months: the longest project ran for 66 months. Over time, the median duration of a project increased from 24 months in 1984 and 1985 to 33 months between 1986 and 1988 and declined to 30 months in 1989 (see Figure 7.1).

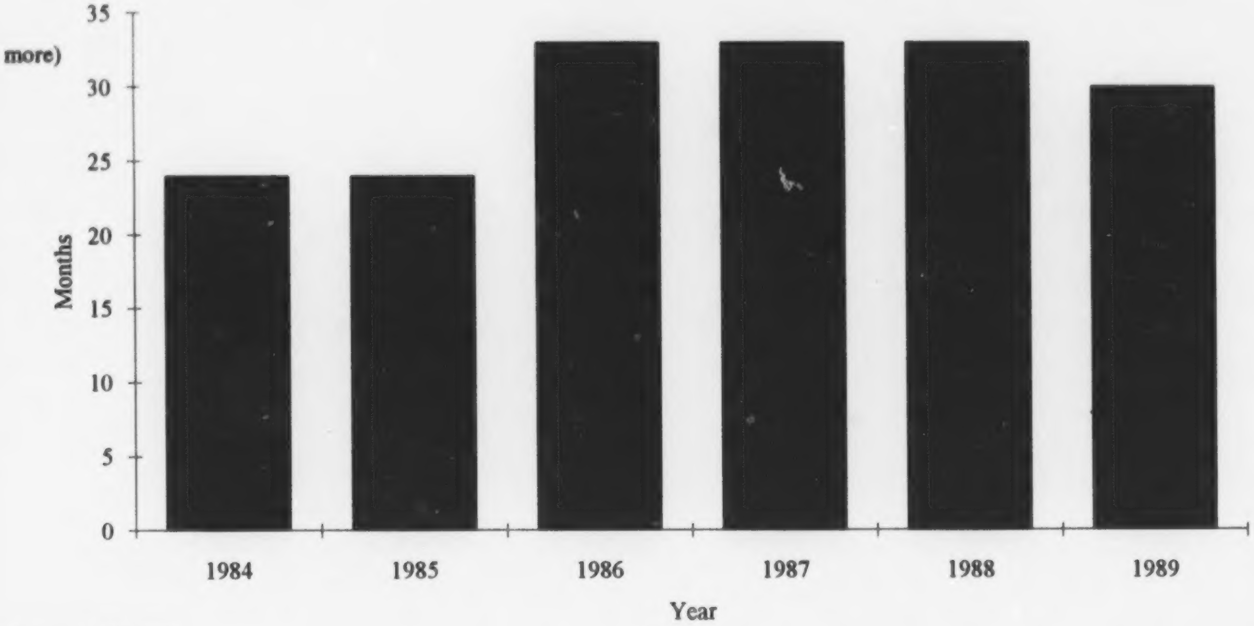
Examination of the data revealed that there was considerable variation in the size of TEP projects. As shown in Figure 7.2, over time, there were fewer small projects (those with between five and 34 participants) -- 18.0 percent in 1989, and a greater proportion of medium sized projects (those with 35 to 99 participants) -- 64.3 percent in 1989. The remaining 17.7 percent of projects in 1989 had 100 or more participants.

7.2 *Project Resources*

7.2.1 *Principal Investigator Days*

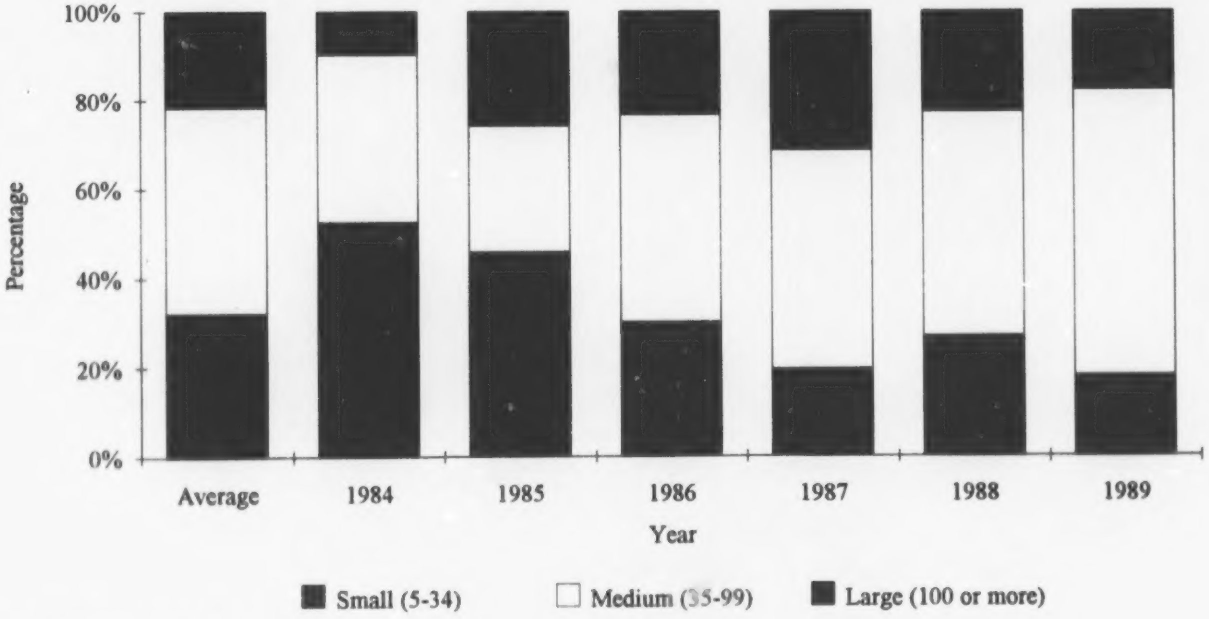
Project resources were defined in both quantitative and qualitative terms. Total resources consists of the number of person days a project provides in project development and operations. The diversity of backgrounds represented by staff working on the projects is also a factor; where did most of the support come from?

Figure 7.1 - Median Months of Operation of TEP Projects, by Award Cohort



Source: NSF/TEP

Figure 7.2 - Proportion of Small, Medium, and Large Projects, by Award Cohort



Source: PI Survey - Item 9

The typical PI devoted an average of 81 days per year to his or her project. Over time, as seen in Figure 7.3, the average number of days spent by PIs increased from 69 in 1984 to 84 days in 1989 after reaching a peak of 99 days in 1987.

7.2.2 *Other Support Staff Days*

A total of 163 person-days of additional staff time was provided by staff members other than the PI. As seen in Figure 7.4, between 1984 and 1989 the mean number of annual person-days provided by these other staff members more than doubled -- from 101 in 1984, to 212 in 1989.

7.2.3 *Total Project Resources*

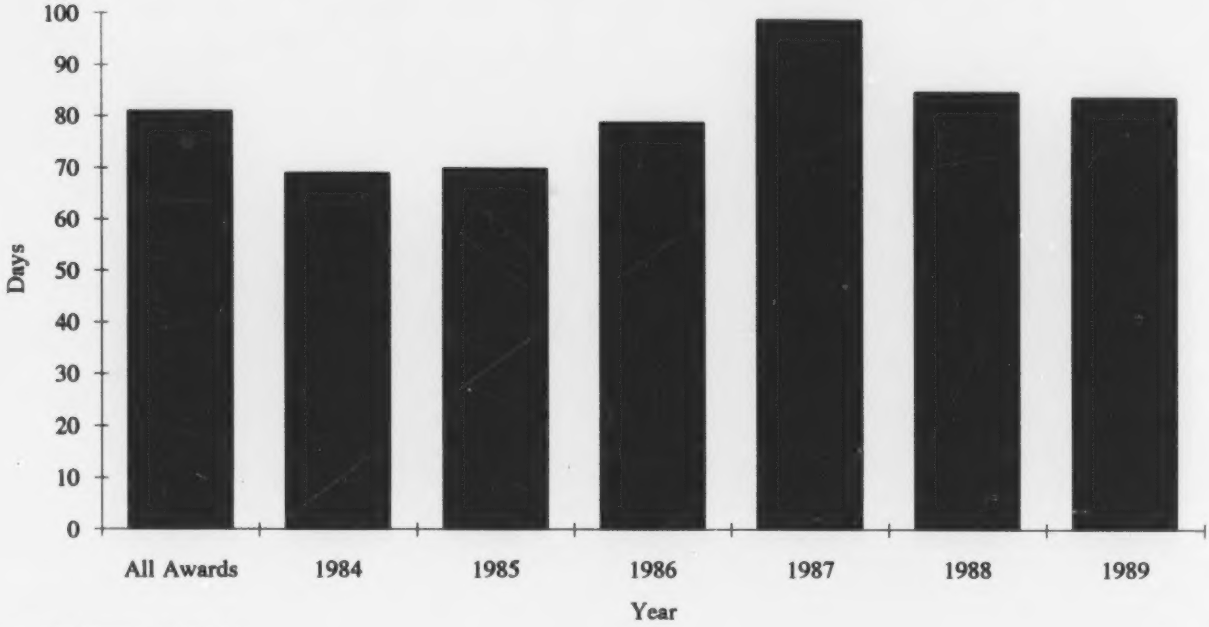
Combining PI and other staff support, a typical project provided 244 person-days of project staff time per year (see Figure 7.5). Over time, the number of person-days devoted to a typical TEP project increased steadily from 170 in 1984 to 296 in 1989, primarily as a function of the large increase in support available from staff members other than the PI. Non-PI staff time accounted, on average, for 66.8 percent of all project labor.

7.3 *Organizational Affiliation of Other Support Staff*

An important related question pertains to the types of organizational affiliation of project staff. As seen in Figure 7.6, the most frequently reported contributing organizations were college or university faculty in science (62.2%), college or university faculty from the education school or department (39.2%), and pre-college teachers who were not former participants (33.6%). Other sources of support reported by roughly 30 percent of PIs included college or university faculty members in mathematics or computer sciences, graduate students, and former TEP participants.

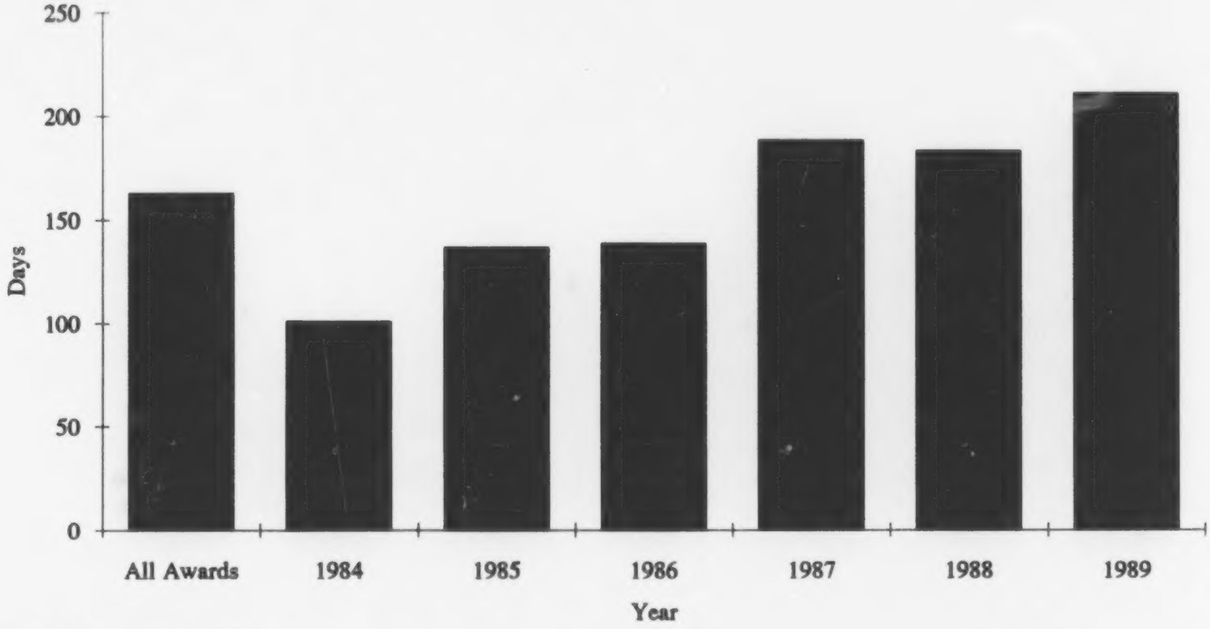
A somewhat different perspective is provided by examining the total annual person-days contributed to all TEP projects by persons from these organizations (see Figure 7.7). College and university faculty worked the greatest number of days on these TEP projects, including: science departments' staff (65 person-days), mathematics and computer sciences staff (51 days), and education school or department staff (43 person-days). Other organizations providing the greatest number of person days annually, on average, were museum staff (75

Figure 7.3 - Average Number of PI Person-Days for TEP Project Year, by Award Cohort



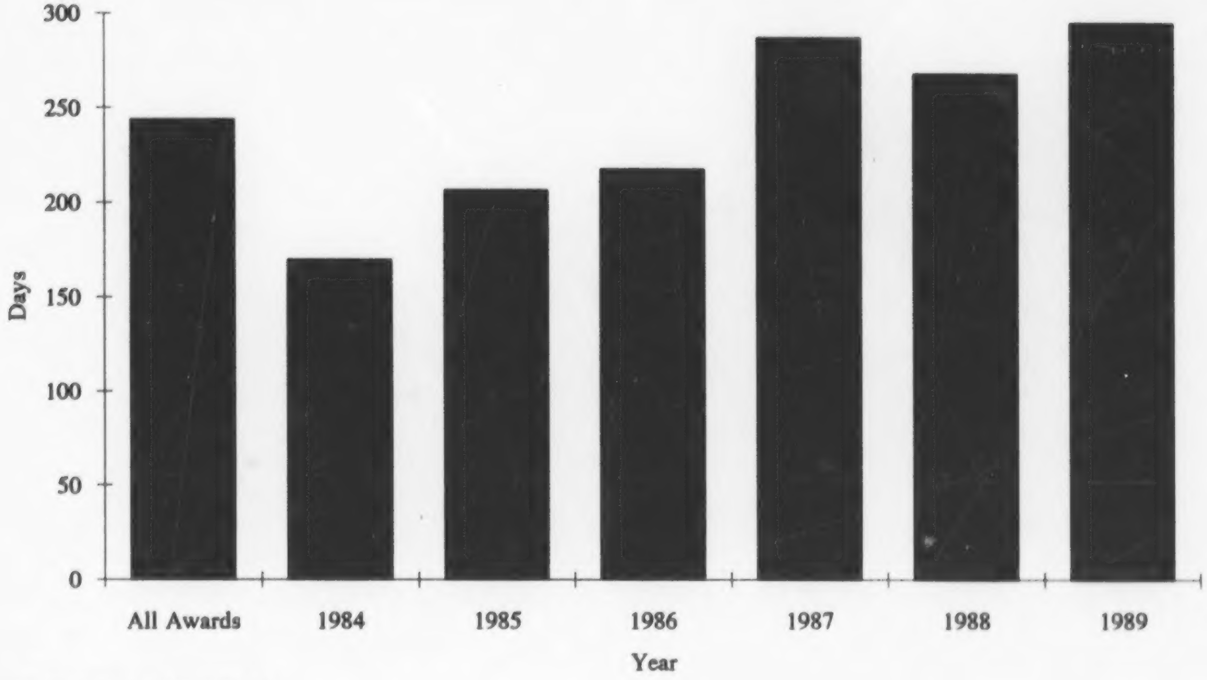
Source: PI Survey - Item 37

Figure 7.4 - Average Other Support Staff Days for TEP Project, by Award Cohort



Source: PI Survey - Item 39

Figure 7.5 - Average Total Days of Staff Time for TEP Project, by Award Cohort



Source: PI Survey - Item 37,39

Figure 7.6 - Persons Who Served as Co-Investigators or Instructional Staff Members, by Organizational Affiliation

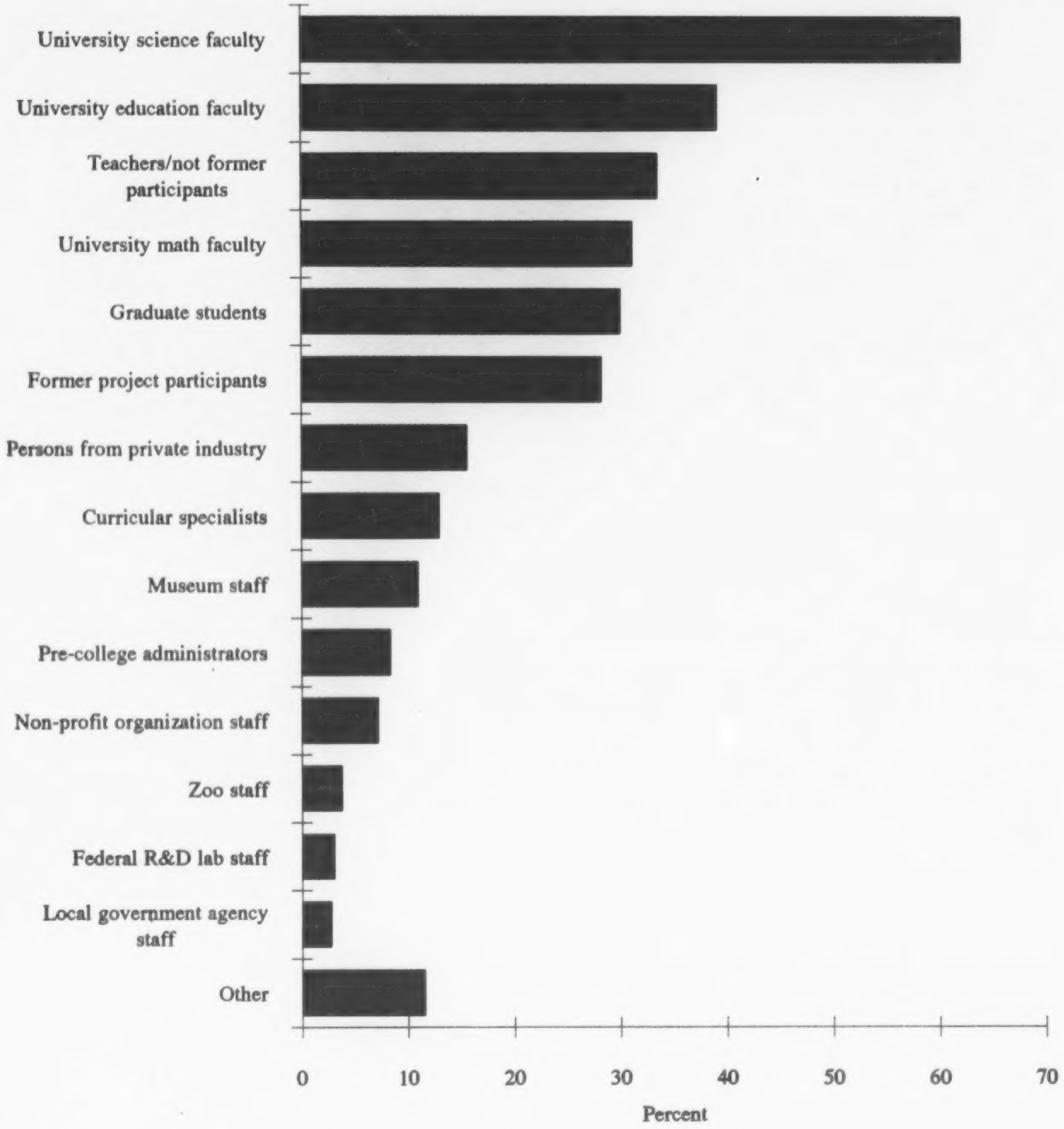
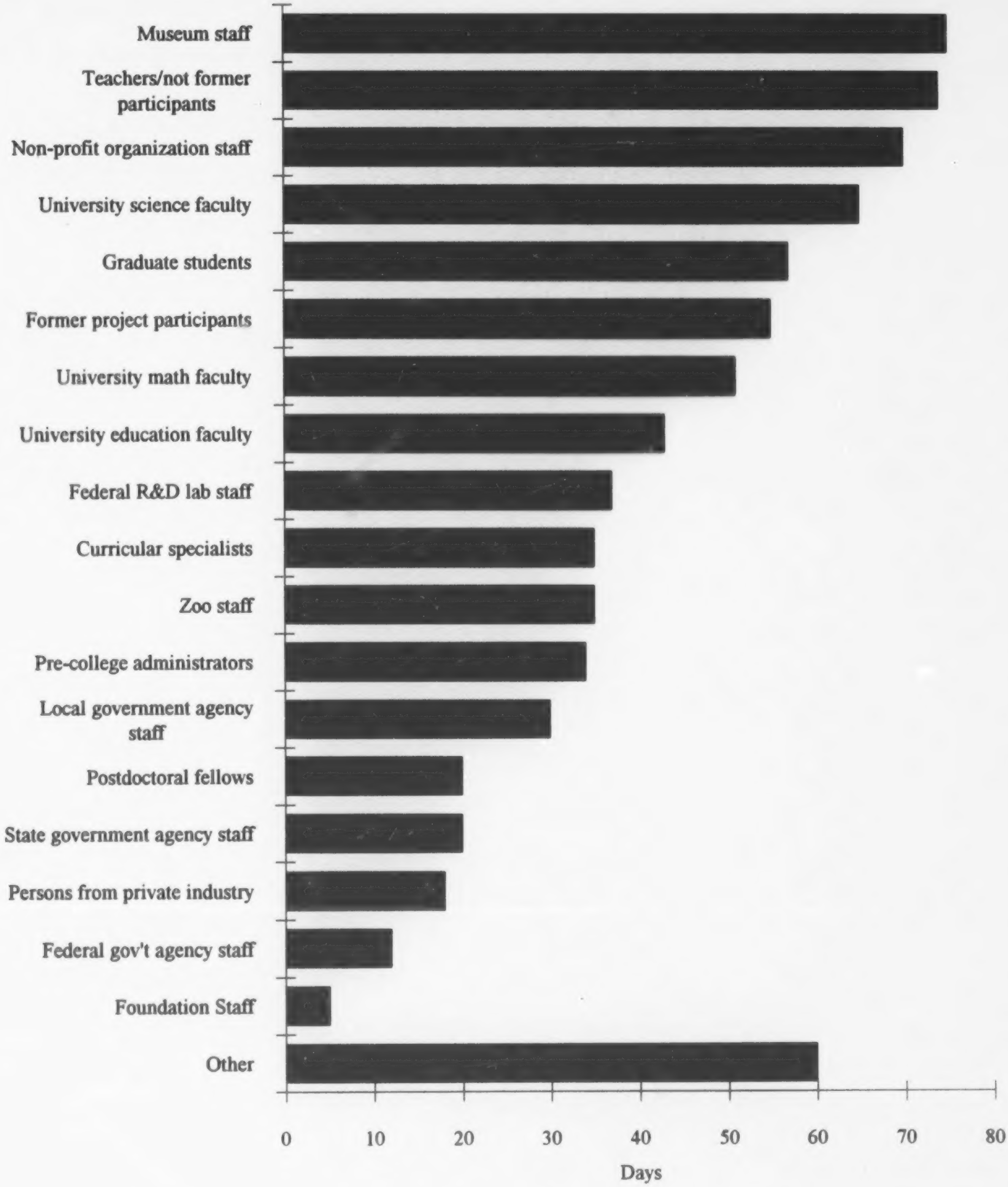


Figure 7.7 - Average Annual Person Days of Individuals Who Served as Co-Investigators or Instructional Staff Members, by Organizational Affiliation



Source: PI Survey - Item 39

person-days), pre-college teachers who were not former participants (74 person-days), and other non-profit organization staff (70 person-days). Other organizations contributing 50 or more days included former project participants and graduate students, while federally funded R&D laboratories, zoos, curricula specialists and administrators from pre-college institutions, and local government agency staff all contributed 30 or more person-days annually across all projects.

7.4 Program Components and Contact Hours

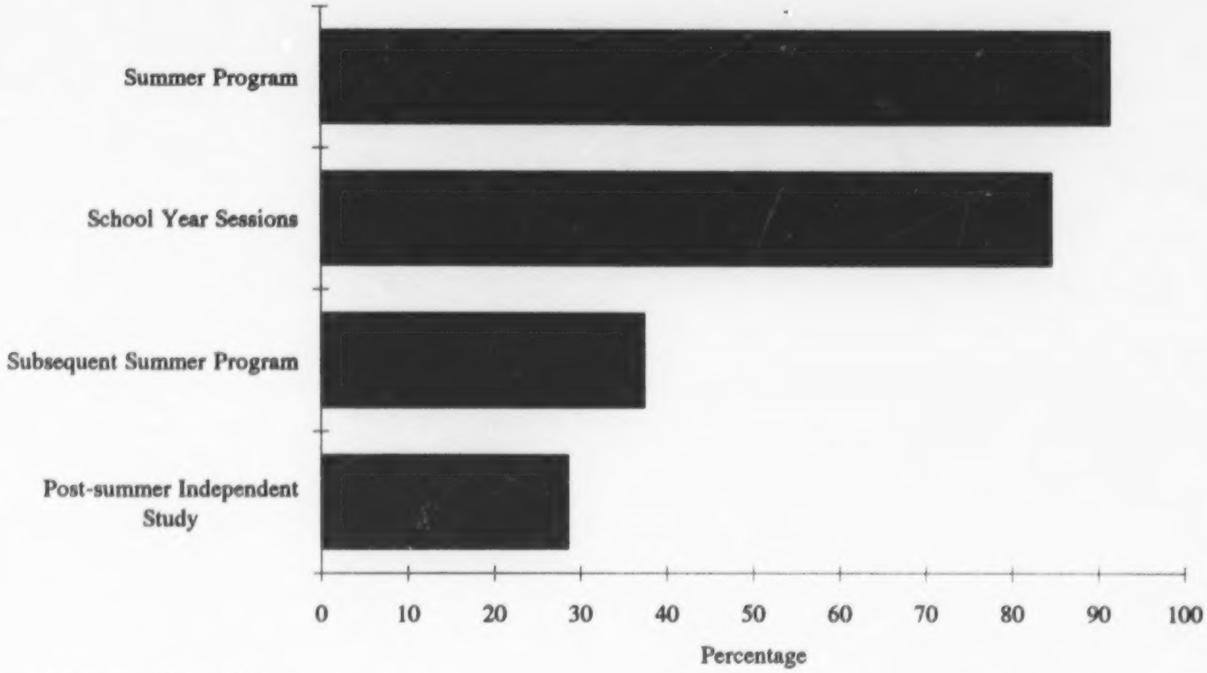
PIs and participants both provided information on various types of project components, their typical duration, and the average number of contact hours available to participants in each case. We begin with an overview of the percentage of PIs reporting each type of program component as compared with similar reports of participants. As shown in Figure 7.8A, according to PIs, fully 91.5 percent of TEP projects included a summer program, and 84.7 percent of projects met during the school year. More than one-third (37.5%) of all TEP projects had subsequent summer programs for the same participant and more than a quarter (28.6%) included a post-summer independent study component.

Over time, TEP projects increased the amount of follow-up contact they had with participants after the initial summer program. The percentage of TEP projects that include subsequent summer programs for the same participant has risen steadily from 17.8 percent in 1984 to 50.8 percent in 1989, and the percentage of projects that met during the school year reached a high of 90.5 percent in 1988. This corresponds with an increasing emphasis, by NSF, on the need for PI follow-up activities with their participants.

Participants also reported on the components of their programs. As shown in Figure 7.8B, 85.6 percent of participants reported having attended a summer TEP program, 63.2 percent participated in sessions held during the school year, 31.1 percent attended a subsequent summer program, and 29.1 percent took part in a post-summer independent study. PI and participant reports of the different components of TEP projects corresponded closely.

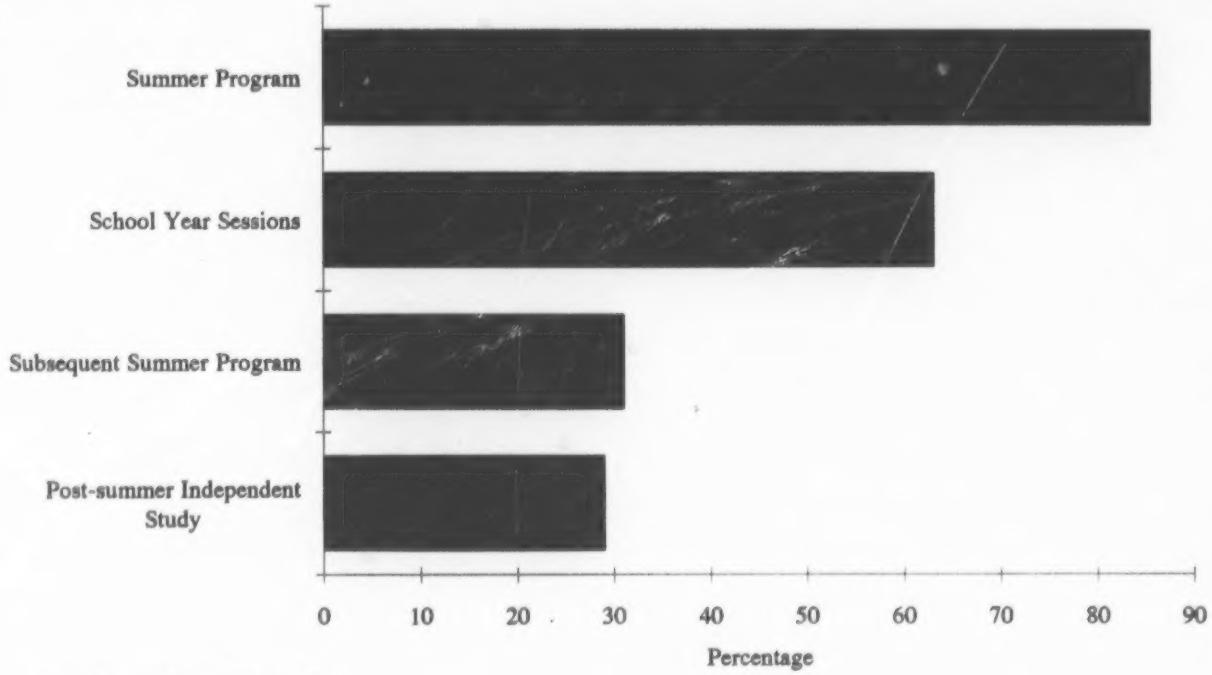
Over time, the percentage of participants that reported attending subsequent summer sessions for their TEP programs increased steadily from 9.8 percent in 1984 to 55.7 percent in 1990. Participant enrollment in the other follow-up components, school year sessions and post-summer independent studies, remained level over time.

Figure 7.8A - PI Reported Components of a TEP Project



Source: PI Survey - Item 14A

Figure 7.8B - Participant Reported Components of a TEP Project



Source: Participant Survey - Item 3

Characteristics of Summer Programs

Additional data were gathered with respect to the number of weeks of project duration for summer programs (including the first and second years of each project). As seen in Figure 7.9A, a typical TEP summer program lasted for four weeks. According to PIs, the average length of summer projects remained constant over time.

According to participants, as shown in Figure 7.9B, an average TEP summer program lasted 3.8 weeks. While PIs indicated that the length of TEP projects was constant at 4 weeks over time, participants reported that summer projects have become steadily shorter. In 1984, according to participants, an average TEP program lasted 5.3 weeks, by 1990 TEP summer projects were an average of 3.4 weeks long.

PIs also provided data on the number of contact hours for their various summer projects. As seen in Figure 7.10A, principal investigators whose projects included summer programs reported that those programs consisted of a median of 120 contact hours. The median number of contact hours was constant over the years. In sum, TEP projects were fairly uniform in providing 32 hours per week of contact time, over four weeks.

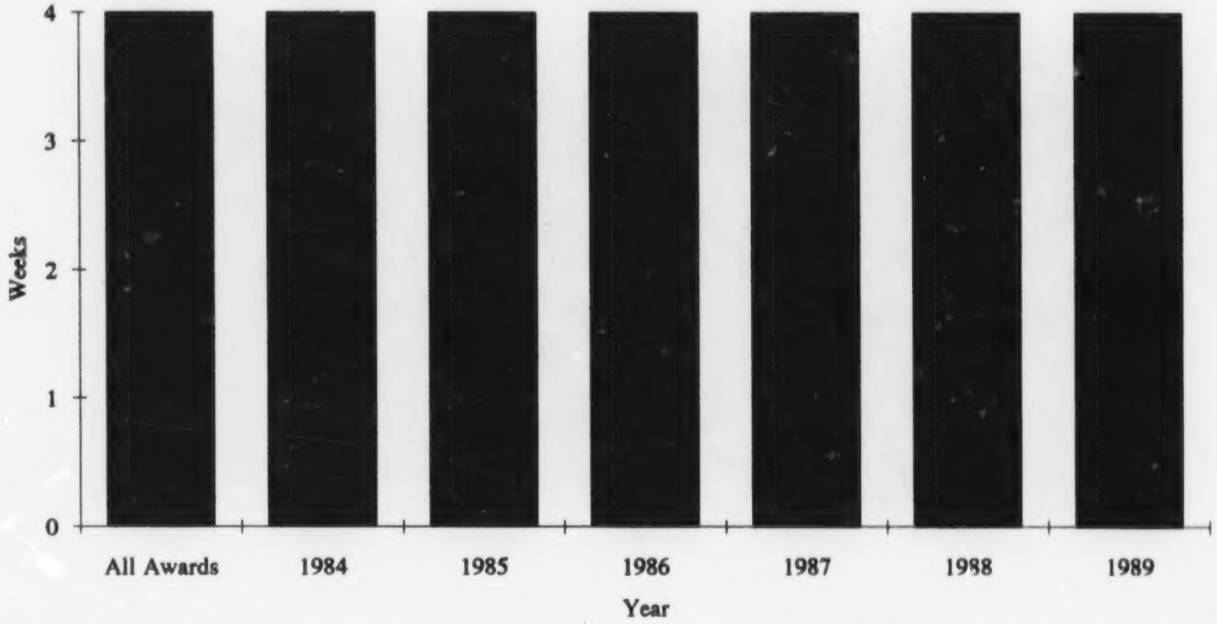
According to participants, as shown in Figure 7.10B, TEP programs had an average of 15 fewer contact hours than were reported by the PIs. TEP participants reported that their projects had an average of 105.4 contact hours. The general trend indicates that participants are receiving fewer contact hours during initial summer projects over time.

Projects During the School Year

Data were also gathered with respect to the number of project sessions for TEP projects during the school year. As shown in Figure 7.11A, TEP projects met a median of four times during the school year. Over time, the median number of meetings ranged from three in 1984 and 1985 to six in 1986 and 1989.

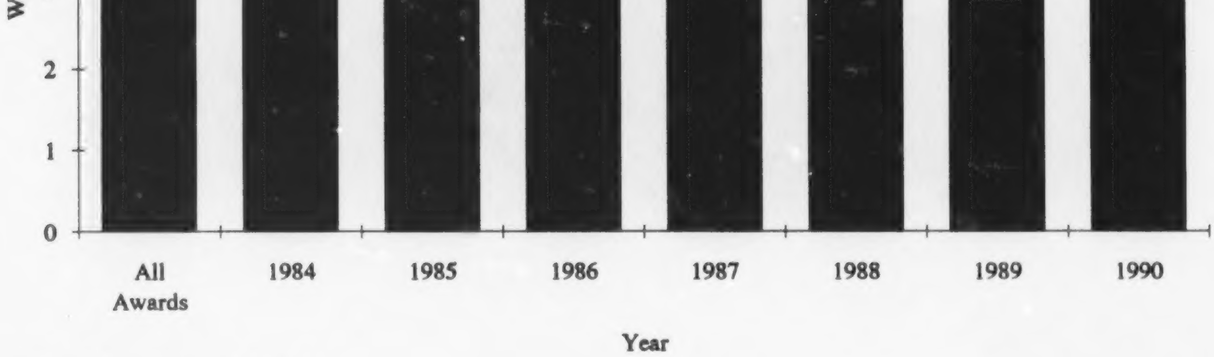
Participants were also asked about the number of TEP project sessions that they attended during the school year. Across all years, 63.2 percent of TEP participants reported attending project sessions during the school year; this percentage did not change greatly over time. Participants reported that they attended more than twice as many school year project sessions than were reported by PIs. Participants reported having attended an average of 8.7

Figure 7.9A - Median PI Reported Weeks in Initial TEP Summer Projects, by Award Cohort



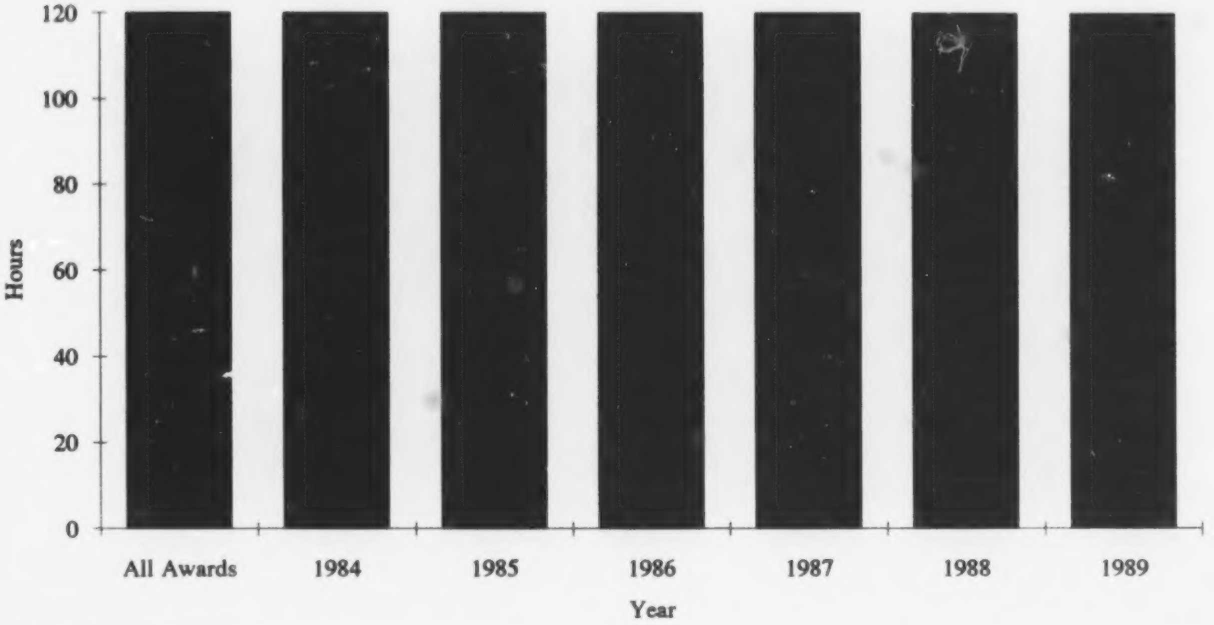
Source: PI Survey - Item 14

Figure 7.9B - Median Participant Reported Weeks in Initial TEP Summer Projects, by Award Cohort



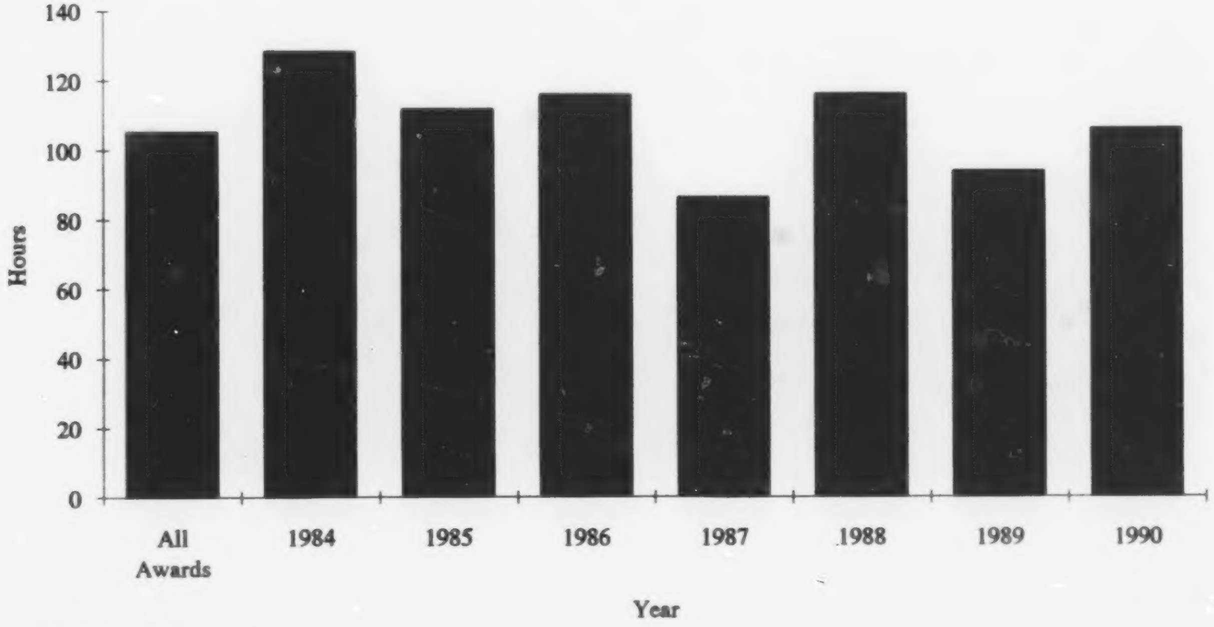
Source: Participant Survey - Item 3

Figure 7.10A - PI Reported Median Number of Contact Hours in Initial TEP Summer Projects, by Award Cohort



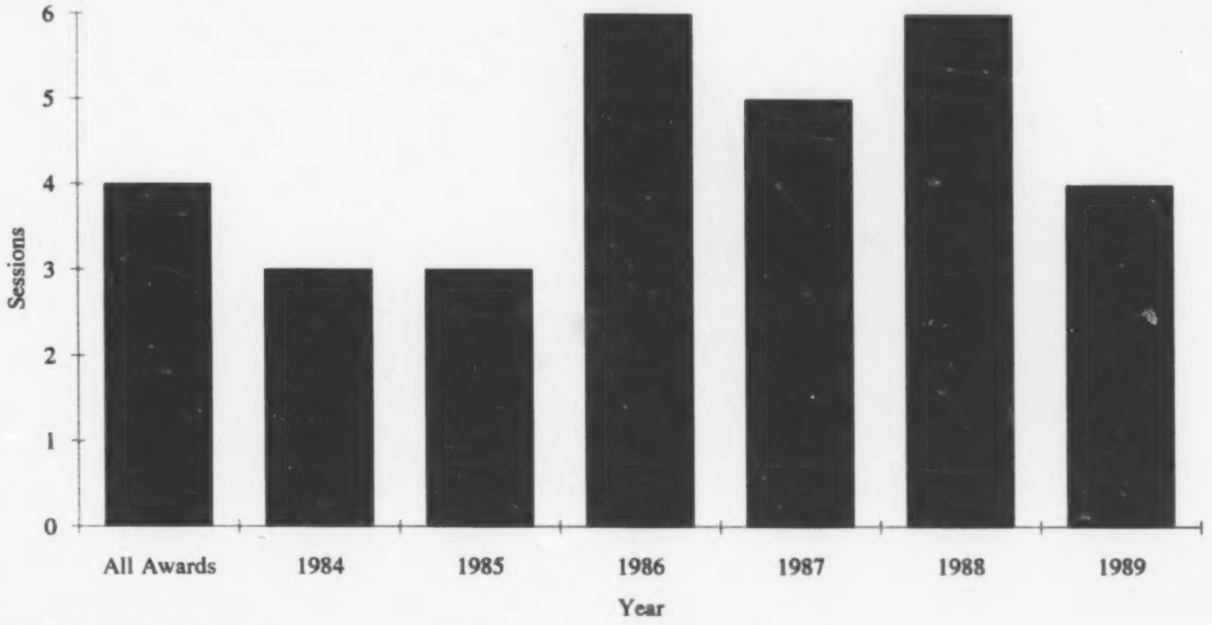
Source: PI Survey - Item 14

Figure 7.10B - Participant Reported Average Number of Contact Hours in Intial TEP Summer Projects, by Award Cohort



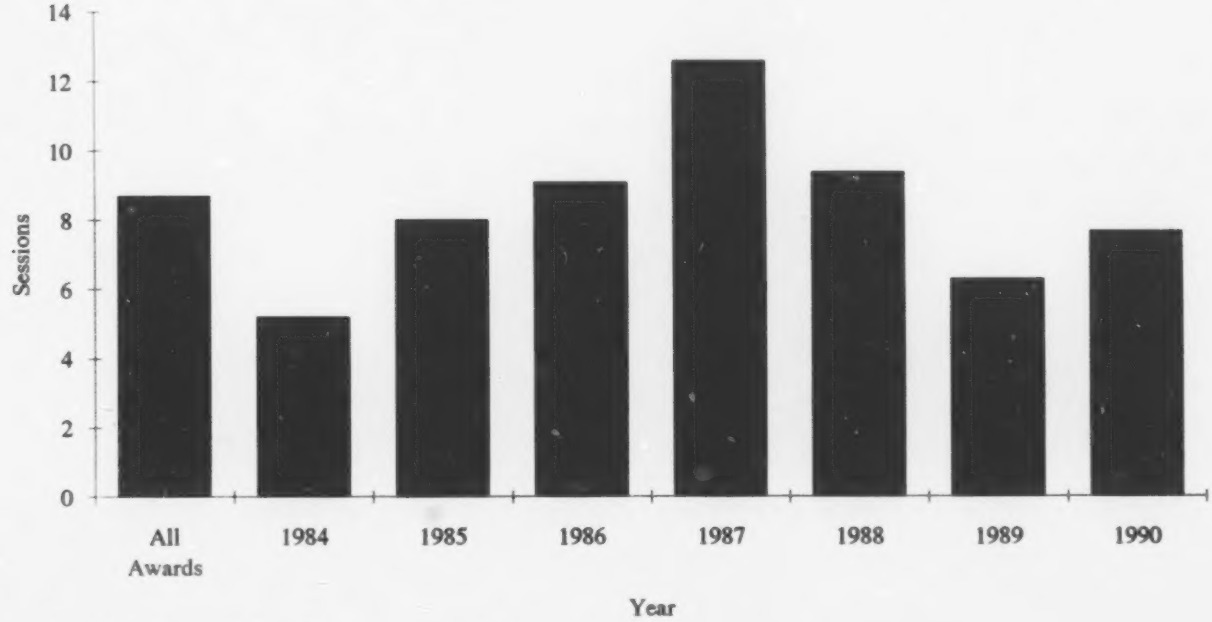
Source: Participant Survey - Item 3

Figure 7.11A - PI Reported Median Number of TEP Project Session During School Year, by Award Cohort



Source: PI Survey - Item 14

Figure 7.11B - Participant Reported Median Number of TEP Project Sessions During School Year, by Award Cohort



Source: Participant Survey - Item 3

school year meetings for their TEP projects. Over time, the median number of TEP project sessions attended by participants during the school year ranged from 5.2 in 1984 to 12.6 in 1987.

PIs also provided data on the number of contact hours for their various winter projects. As seen in Figure 7.12A, the school year components of TEP projects involved a median of 24 contact hours. Over time, the median number of contact hours ranged from a low of 24 to a high of 28 hours for each school year.

As seen in Figure 7.12B, participants reported receiving a median of 28.5 contact hours as part of school year TEP activities, four hours more than reported by the PIs. Over time, the median number of contact hours reported by participants ranged from 24.3 in 1985 to 34.3 in 1987.

Subsequent Summer Programs

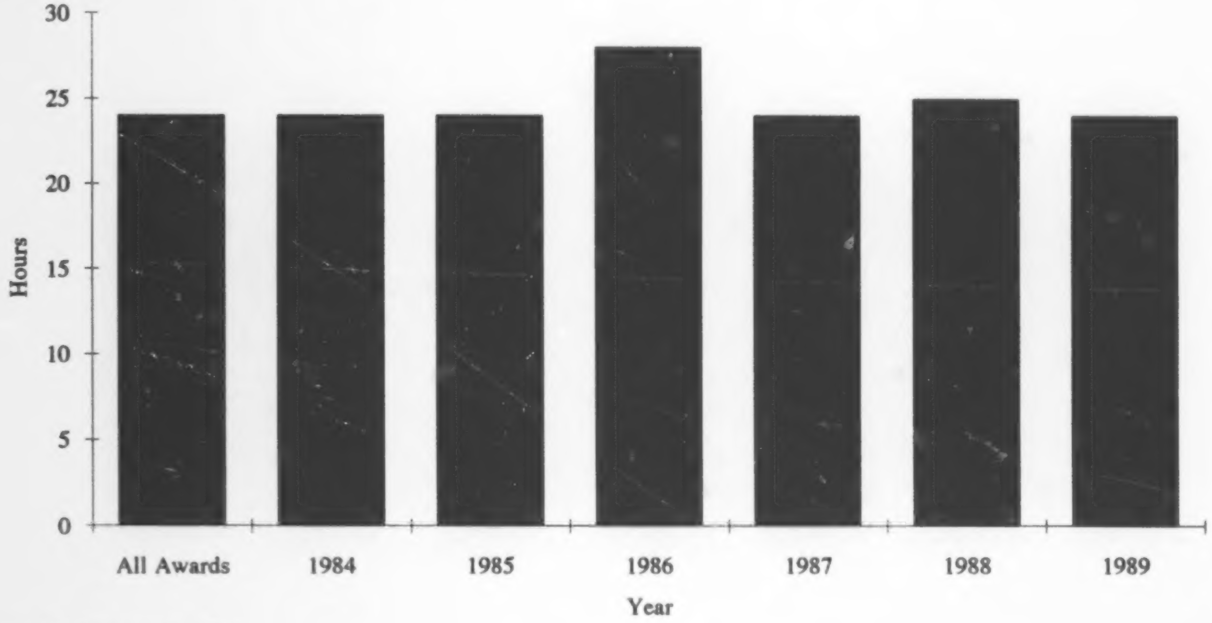
Data were also gathered with respect to the number of weeks training provided under TEP projects in the summer following the first year. According to PIs, a typical TEP subsequent summer program lasted for four weeks (see Figure 7.13A). Over time, the median length of subsequent summer programs ranged between two and six weeks. The trend indicates shorter average durations for subsequent summer programs with those in 1984 and 1985 being longer in duration than those in subsequent years.

Participants were also asked about their participation in subsequent TEP summer projects. Over all years 31.1 percent of participants reported taking part in subsequent summer projects; this percentage increased steadily over time from 9.8 percent in 1984 to 55.7 percent in 1990. According to participants, a typical subsequent summer project lasted for 3.5 weeks, a slightly shorter period of time than was reported by PIs. Over time, the duration of subsequent summer projects remained level with the exception of those held in 1984 which were longer.

PIs provided data on the median number of contact hours for their subsequent summer projects. A typical subsequent summer project included 90 contact hours. As seen in Figure 7.14A, the median number of contact hours fluctuated substantially over the years.

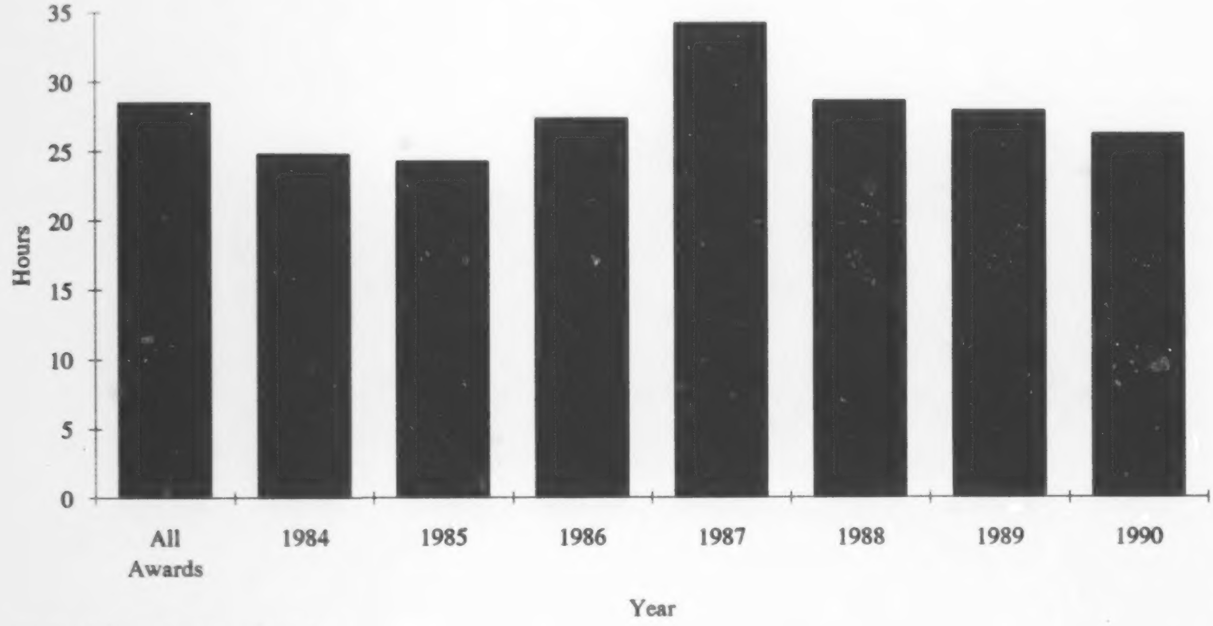
According to participants, as shown in Figure 7.14B, a typical subsequent summer project included 88.9 contact hours with TEP faculty; this was very close to what was reported by the PIs. The trend indicates fewer contact hours for subsequent summer programs over time;

Figure 7.12A - PI Reported Median Number of Contact Hours in TEP School Year Projects, by Award Cohort



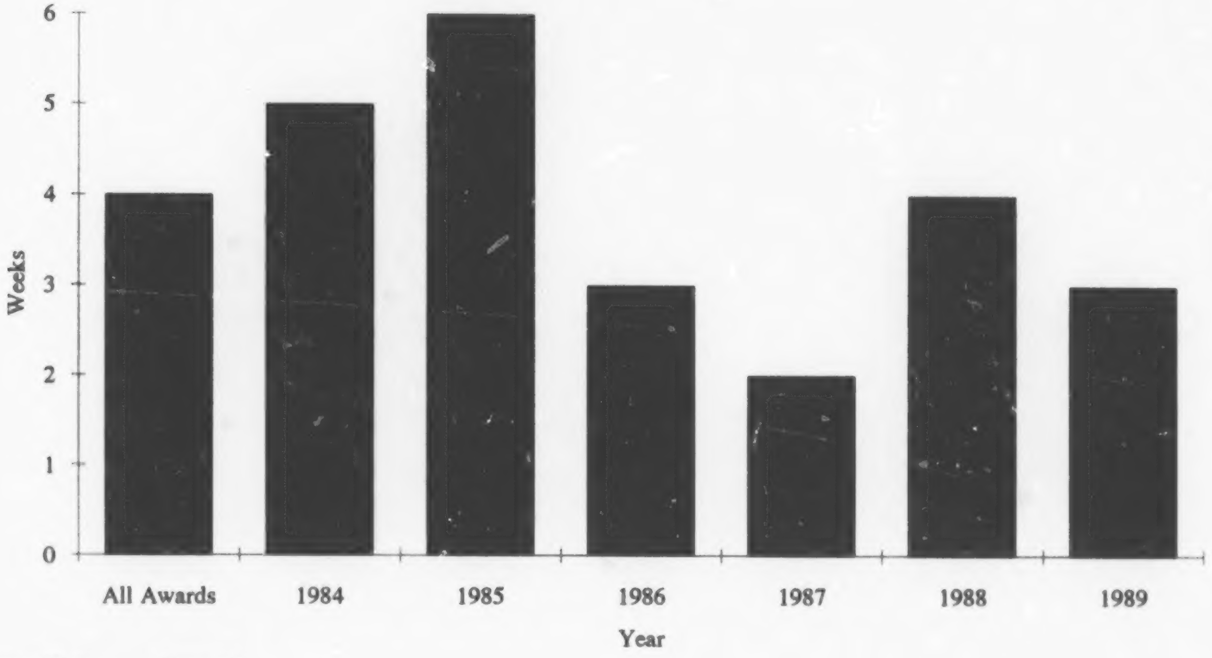
Source: PI Survey - Item 14

Figure 7.12B - Participant Reported Average Number of Contact Hours in TEP School Year Projects, by Award Cohort



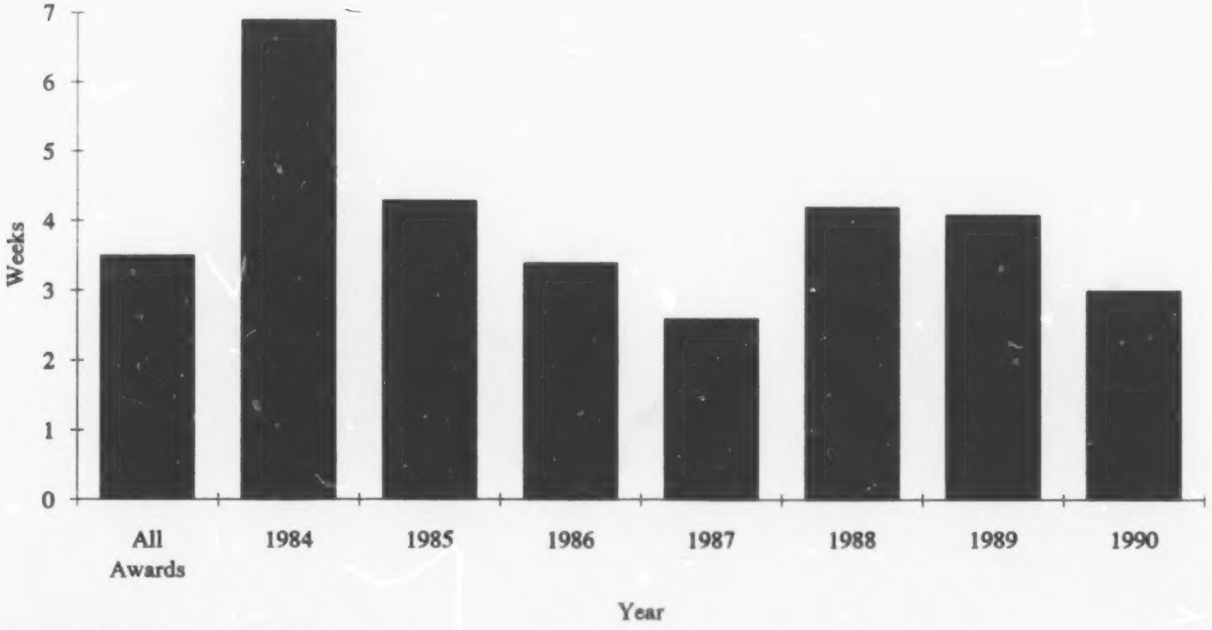
Source: Participant Survey - Item 3

Figure 7.13A - PI Reported Median Number of Weeks in Subsequent TEP Summer Projects, by Award Cohort



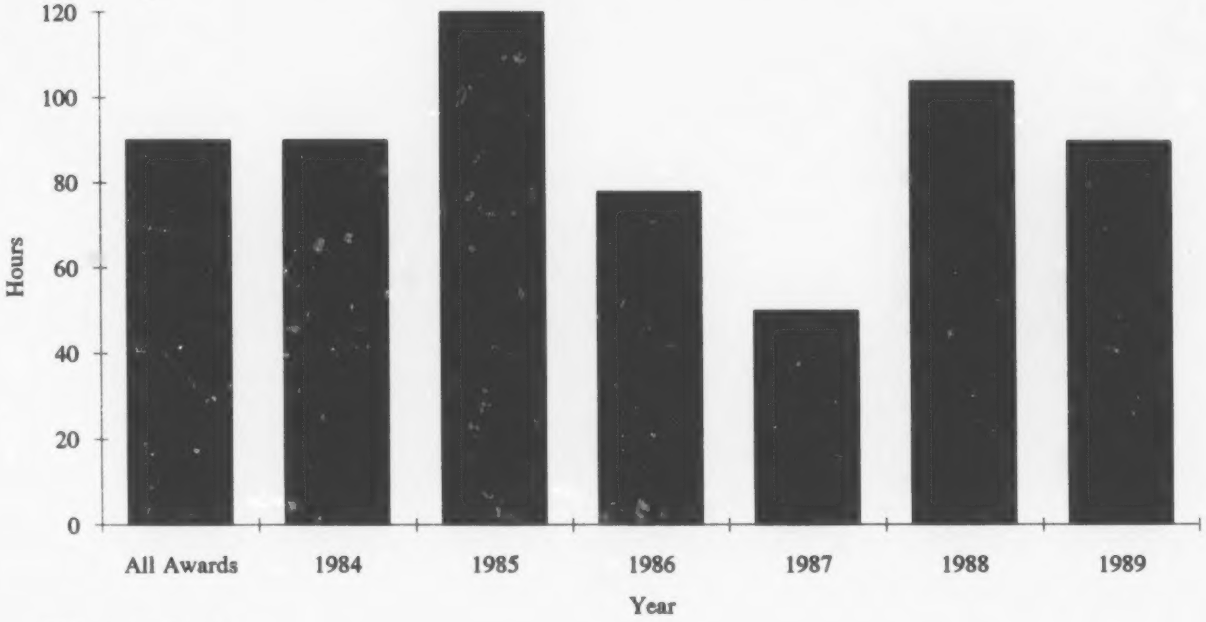
Source: PI Survey - Item 14

Figure 7.13B - Participant Reported Median Number of Weeks in Subsequent TEP Summer Projects, by Award Cohort



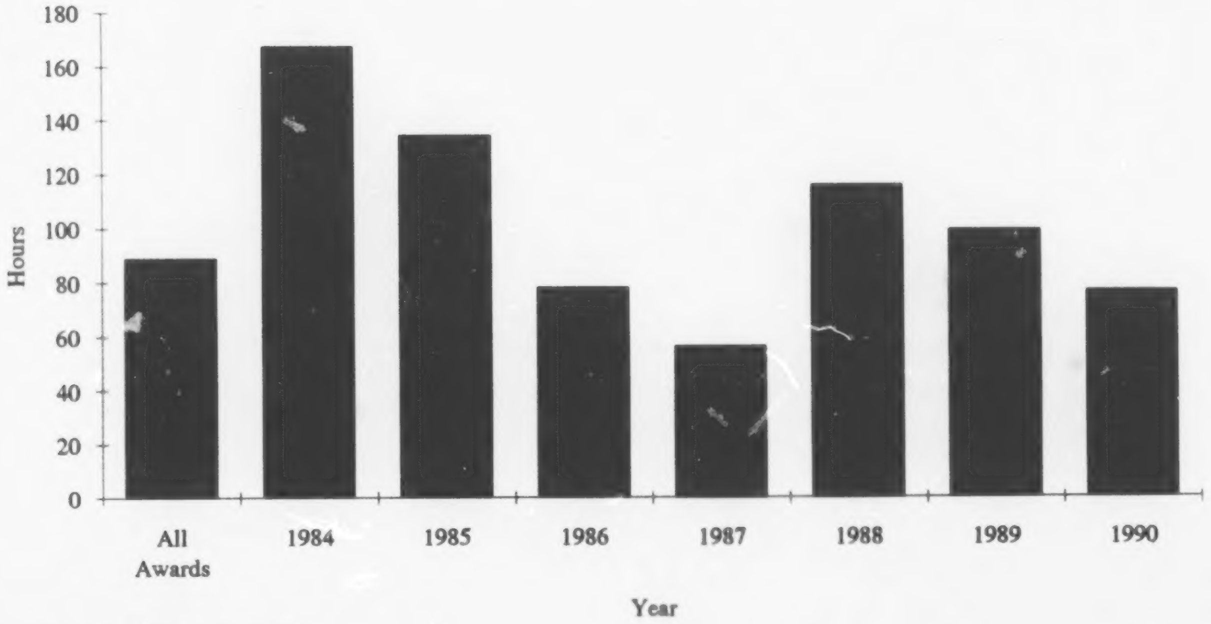
Source: Participant Survey - Item 3

Figure 7.14A - PI Reported Median Number of Contact Hours in Subsequent TEP Summer Projects, by Award Cohort



Source: PI Survey - Item 14

Figure 7.14B - Participant Reported Median Number of Contact Hours in Subsequent TEP Summer Projects, by Award Cohort



Source: Participant Survey - Item 3

the median number of contact hours reported by participants dropped from 167.6 hours in 1984 to 77.1 hours in 1990 with a low of 56.2 hours in 1987.

Post-Summer Independent Study by Participants

PIs reported a median of 25 hours of post-independent study by participants in summer projects. As seen in Figure 7.15A, the median number of hours has ranged from 20 in 1985 and 1988, to 32 in 1986, with no clear pattern emerging.

Across all years, 29.1 percent of all participants report having undertaken a post-summer independent study; this percentage ranged from 14.3 percent in 1986 to 45.0 percent in 1990. Participants reported spending a greater period of time on post-summer independent study than was reported by the PIs, participants reported spending a median of 41.9 hours on independent study. Over time, as seen in Figure 7.15B, the number of hours spent on independent study ranged from 59.6 hours in 1984 to 25.7 hours in 1987.

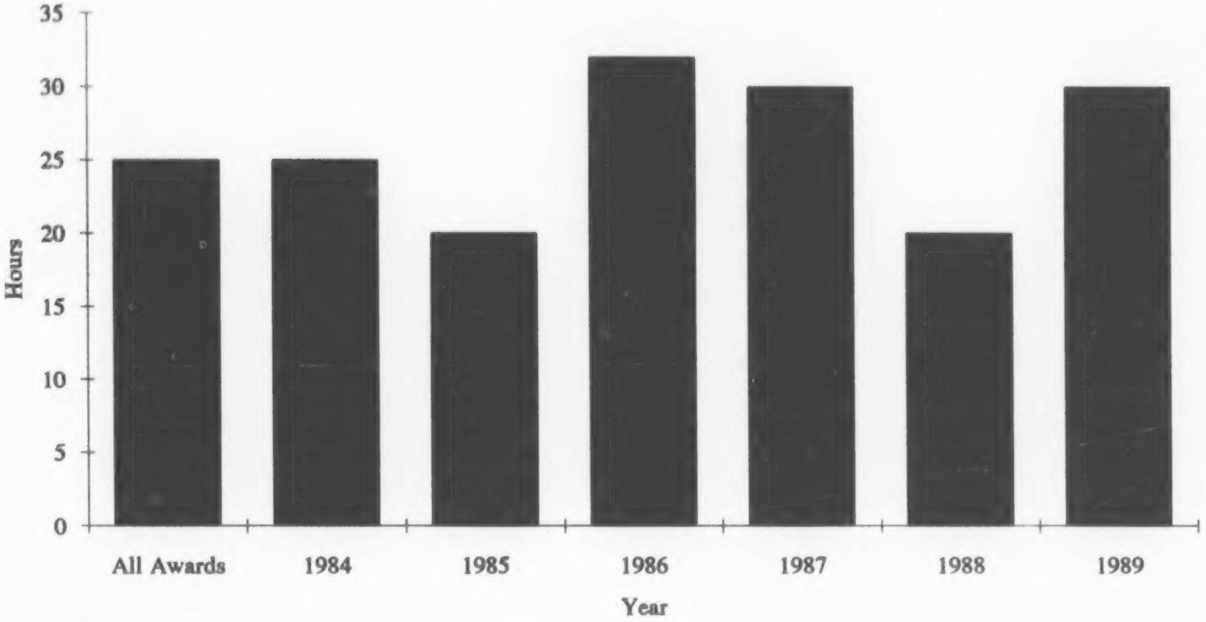
Overview of Participation across Component Types

Looking across project component types, Figures 7.16A summarizes the number of contact hours included by different types of components reported by PIs, while Figure 7.16B provides the same information reported by participants. PIs and participants agreed that initial TEP summer projects included the greatest number of contact hours followed by subsequent summer projects, post-summer independent study, and school year meetings. PIs reported having a greater number of contact hours in initial summer projects than reported by participants, while participants reported more contact hours in school year meetings and post-summer independent study.

7.5 Major Content Emphases of Projects

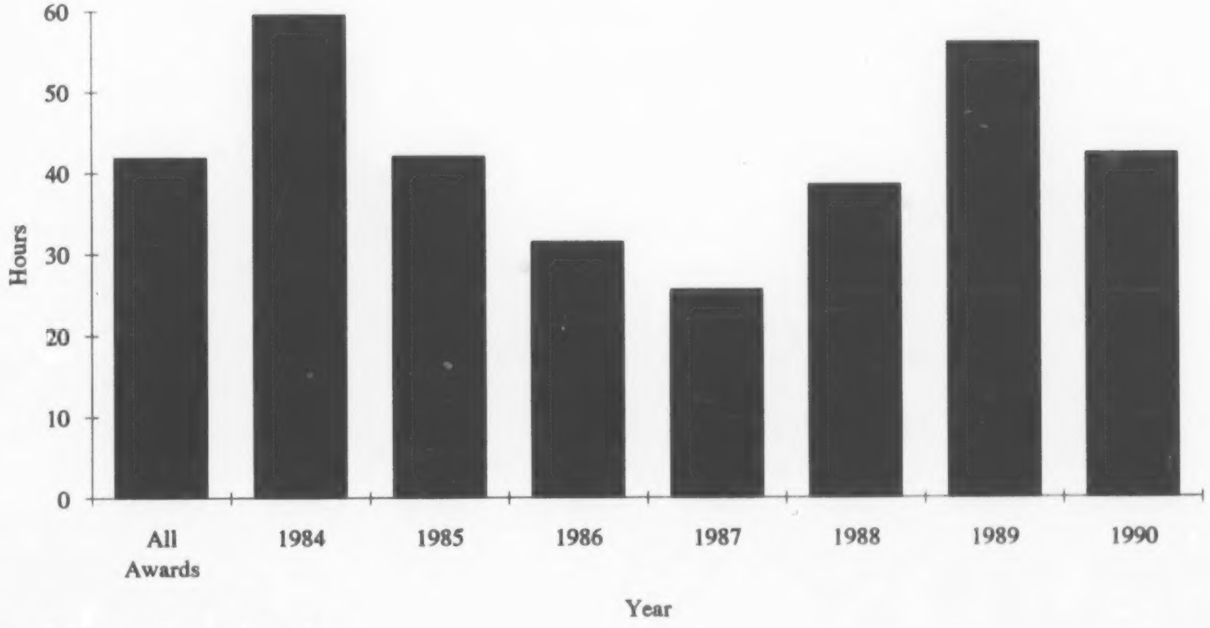
PIs and Participants provided data with respect to those content areas receiving major emphasis in their projects. Content areas were separated for mathematics and sciences. Within this larger dichotomy, the relative emphasis on various areas was broken-out by elementary, middle, and senior high school levels.

Figure 7.15A - PI Reported Median Number of Post-Summer Independent Study Hours in Summer Projects, by Award Cohort



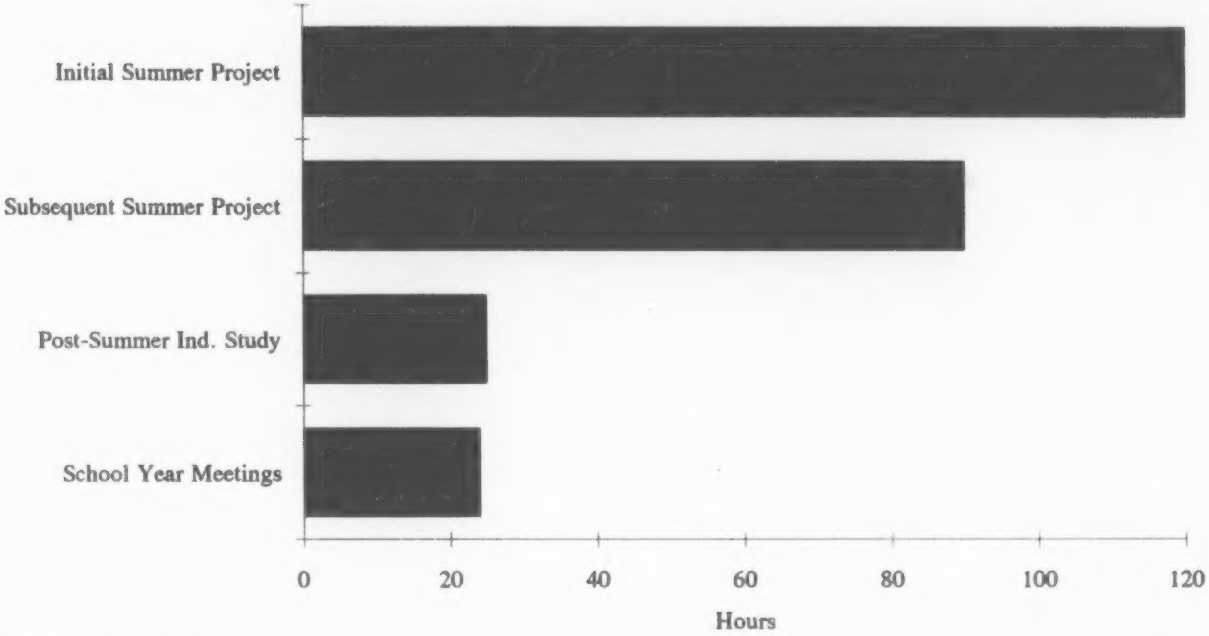
Source: PI Survey - Item 14

Figure 7.15B - Participant Reported Median Number of Post-Summer Independent Study Hours in Summer Projects, by Award Cohort



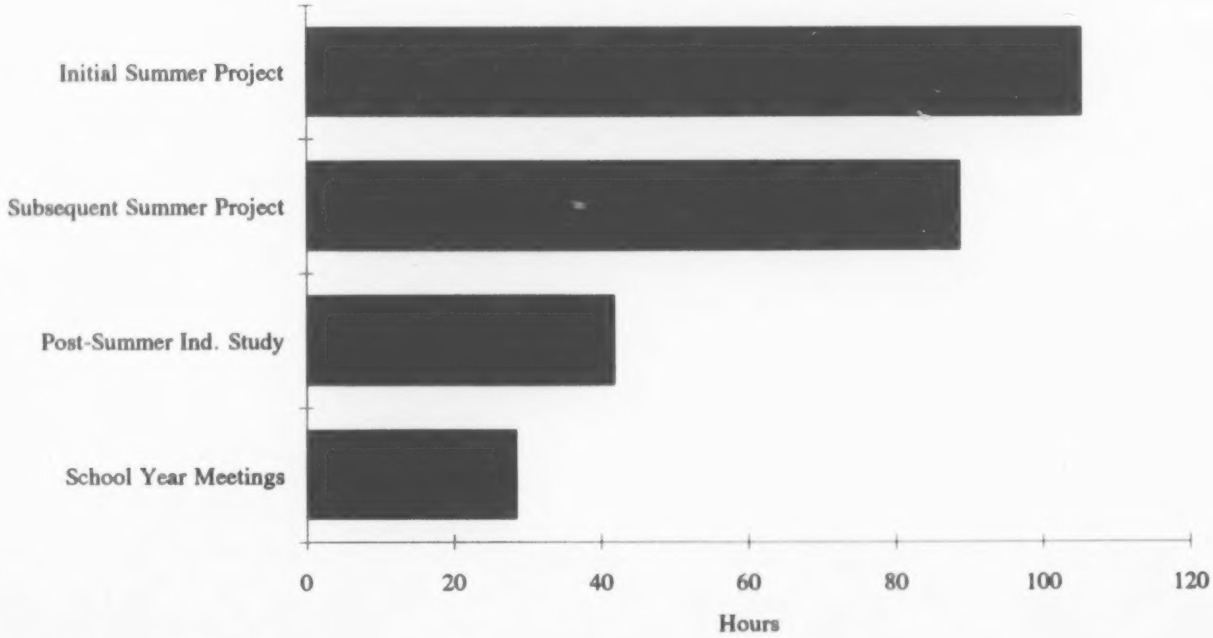
Source: Participant Survey - Item 3

Figure 7.16A - PI Reported Median Number of TEP Project Contact Hours, by Type Component



Source: PI Survey - Item 14

Figure 7.16B - Participant Reported Median Number of TEP Project Contact Hours, by Type Component



Source: Participant Survey - Item 3

7.5.1 Mathematics Subject Areas Emphasized

Elementary School

As shown in Figure 7.17A, according to PIs the most frequently emphasized areas of mathematics at the elementary school level included problem solving with arithmetic (28%), arithmetic computation (26%), and geometry (19%). TEP project participants, as seen in Figure 7.17B, also cited arithmetic problem solving (33.3%) and computation (15.7%) as the areas of elementary level mathematics receiving the greatest emphasis in their projects. In addition, participants cited computer science and programming (10.4%) and the use of computers in math (9.4%) as major areas of emphasis.

Middle School

As shown in Figure 7.18A, according to PIs, the most frequently emphasized areas of mathematics at the middle school level included problem solving with arithmetic (25.8%), probability and statistics (23.7%), geometry (20.9%), and algebra (20.7%). TEP participants, as seen in Figure 7.18B, also confirmed that these same areas of mathematics were given the greatest emphasis in their projects: problem solving with arithmetic (27.1%), probability and statistics (22.2%), and geometry (16.3%).

Senior High School

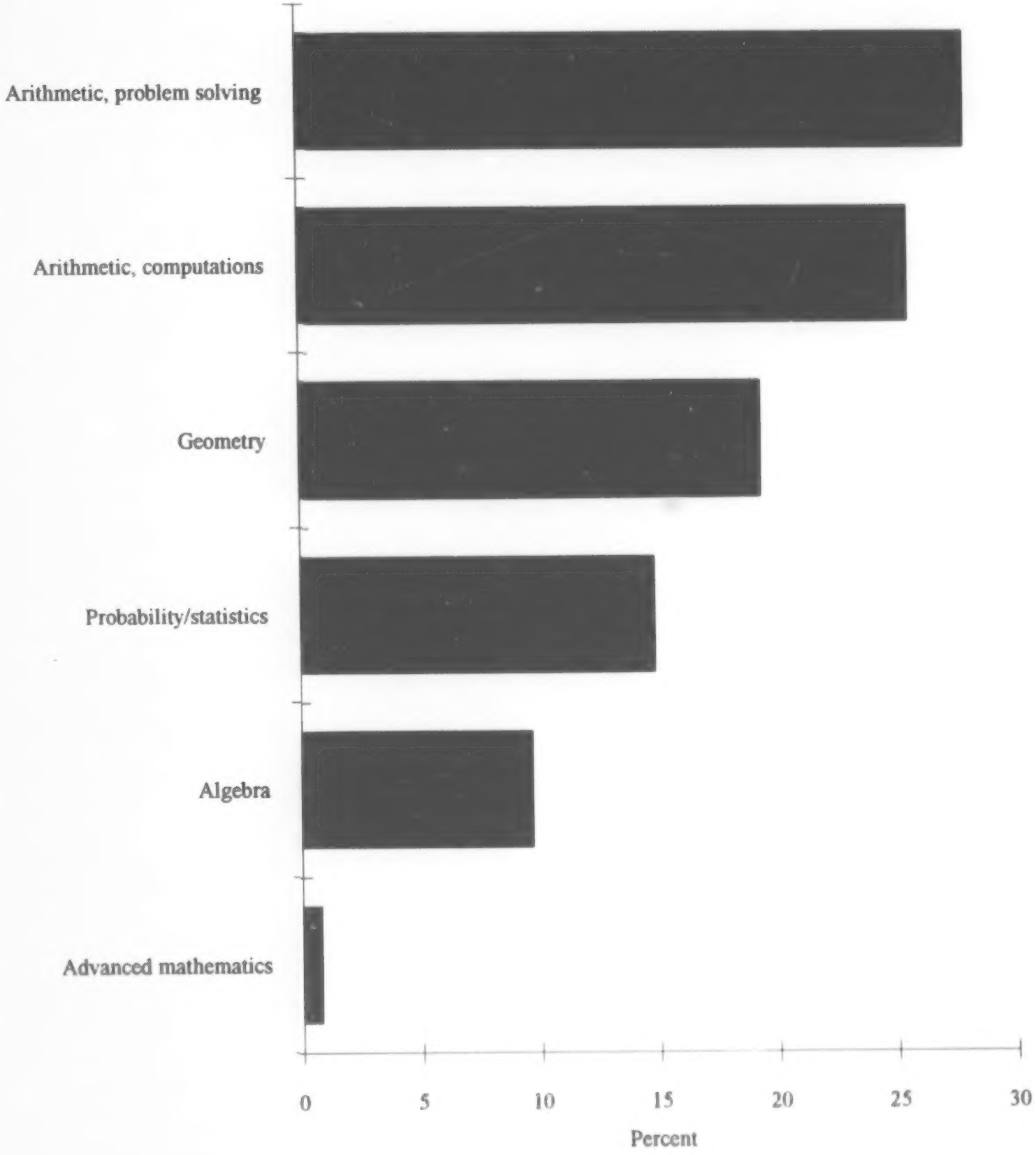
As shown in Figure 7.19A, according to PIs, the most frequently emphasized areas of mathematics at the high school level included probability and statistics (21.4%), geometry (17.7%), and algebra (16.3%). TEP participants, as seen in Figure 7.19B, agreed with PIs that probability and statistics (21.5%), and algebra (17.3%) were areas of mathematics receiving major emphasis in TEP projects, but also included problem solving with arithmetic (18.5%) as another important area of concentration.

7.5.2 Science Subject Areas Emphasized

Elementary School

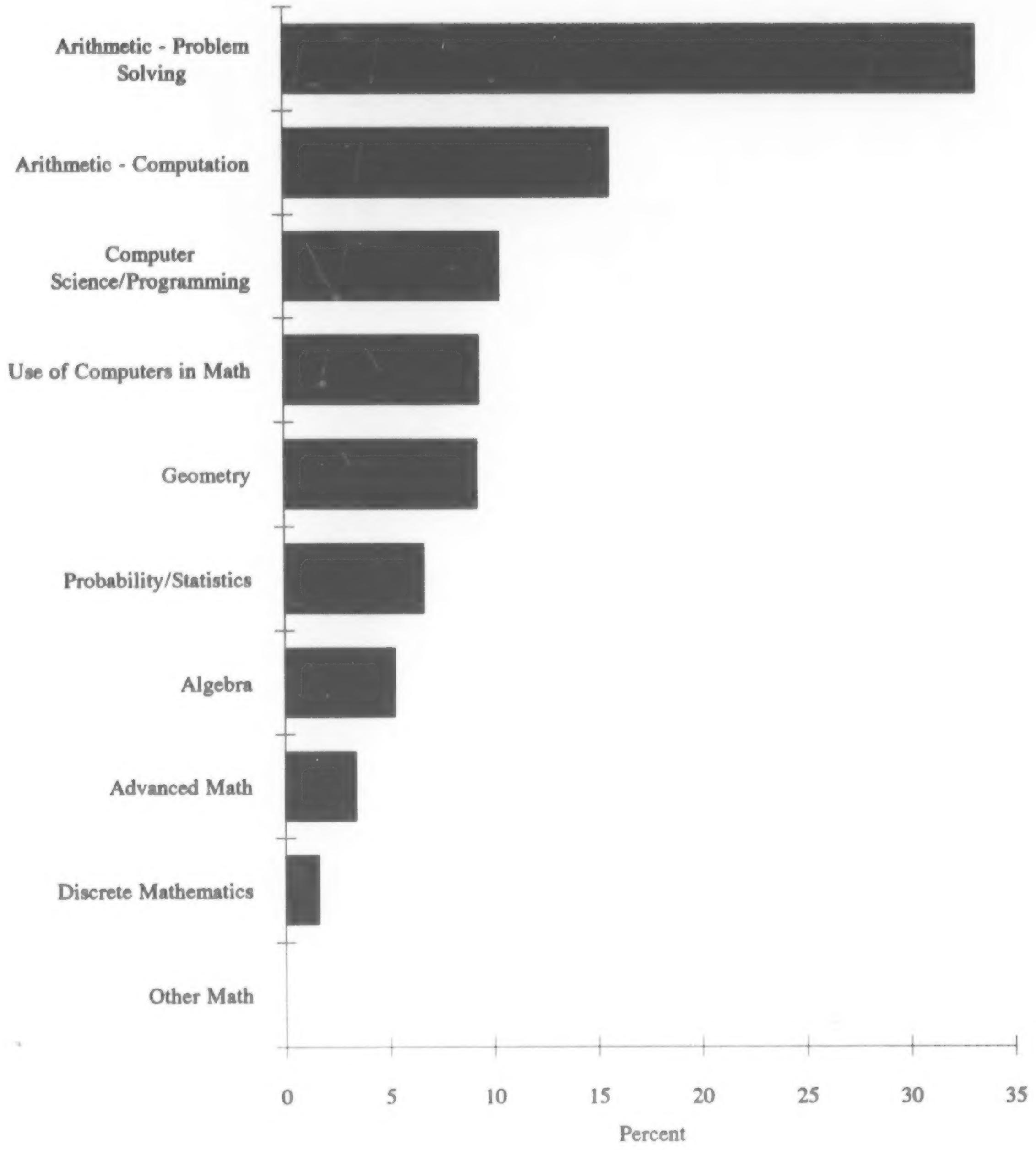
As shown in Figure 7.20A, according to PIs, the most frequently emphasized areas of science at the elementary school level included earth science (48.0%), biological sciences (46.6%), physics (43.2%), and chemistry (36.2%). The areas of sciences that

Figure 7.17A - PI Reported Areas of Mathematics Receiving Major Emphasis in TEP Projects: Elementary School Level, by Award Cohort



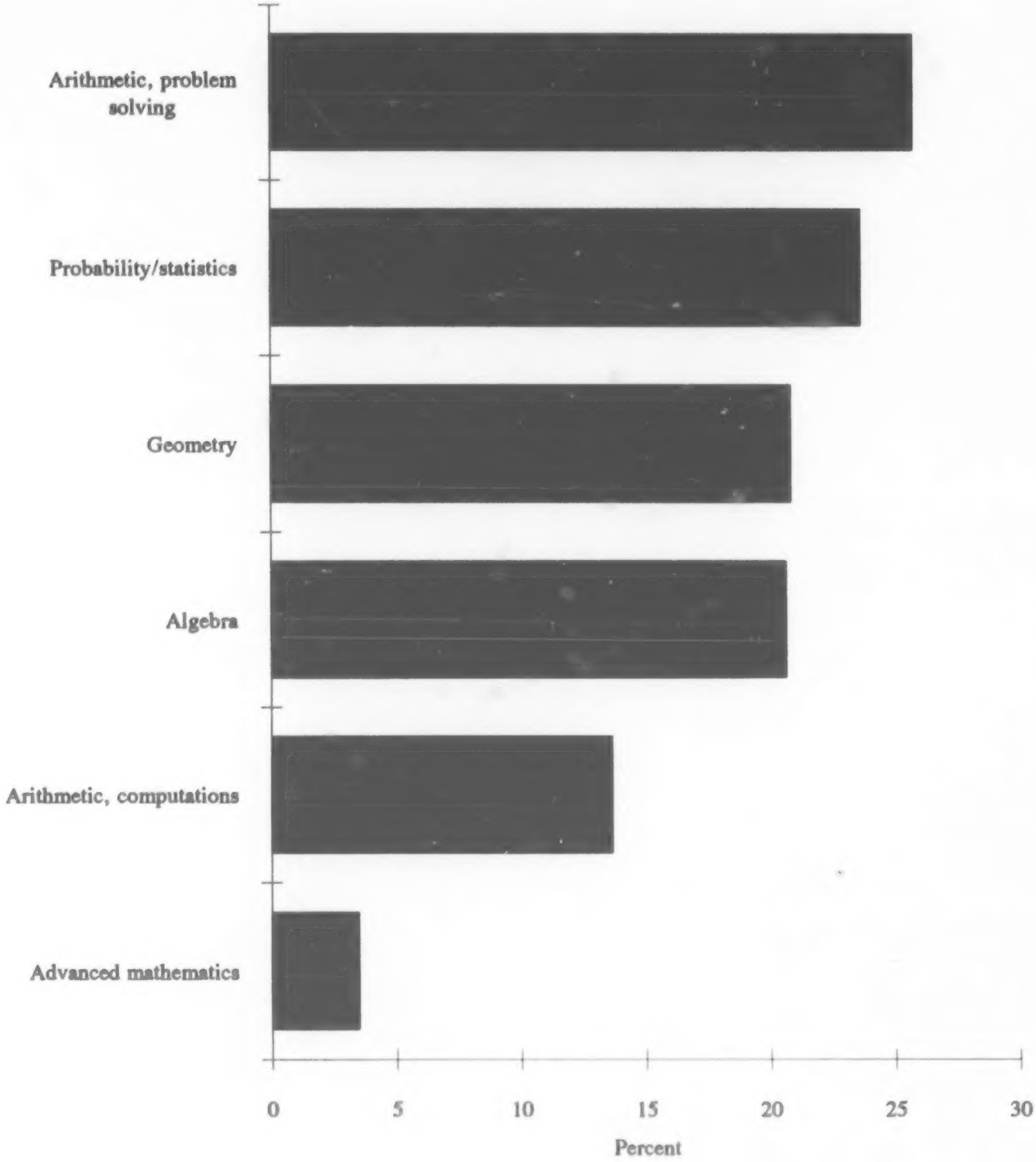
Source: PI Survey - Item 15

Figure 7.17B - Participant Reported Areas of Mathematics Receiving Major Emphasis in TEP Projects: Elementary School Level



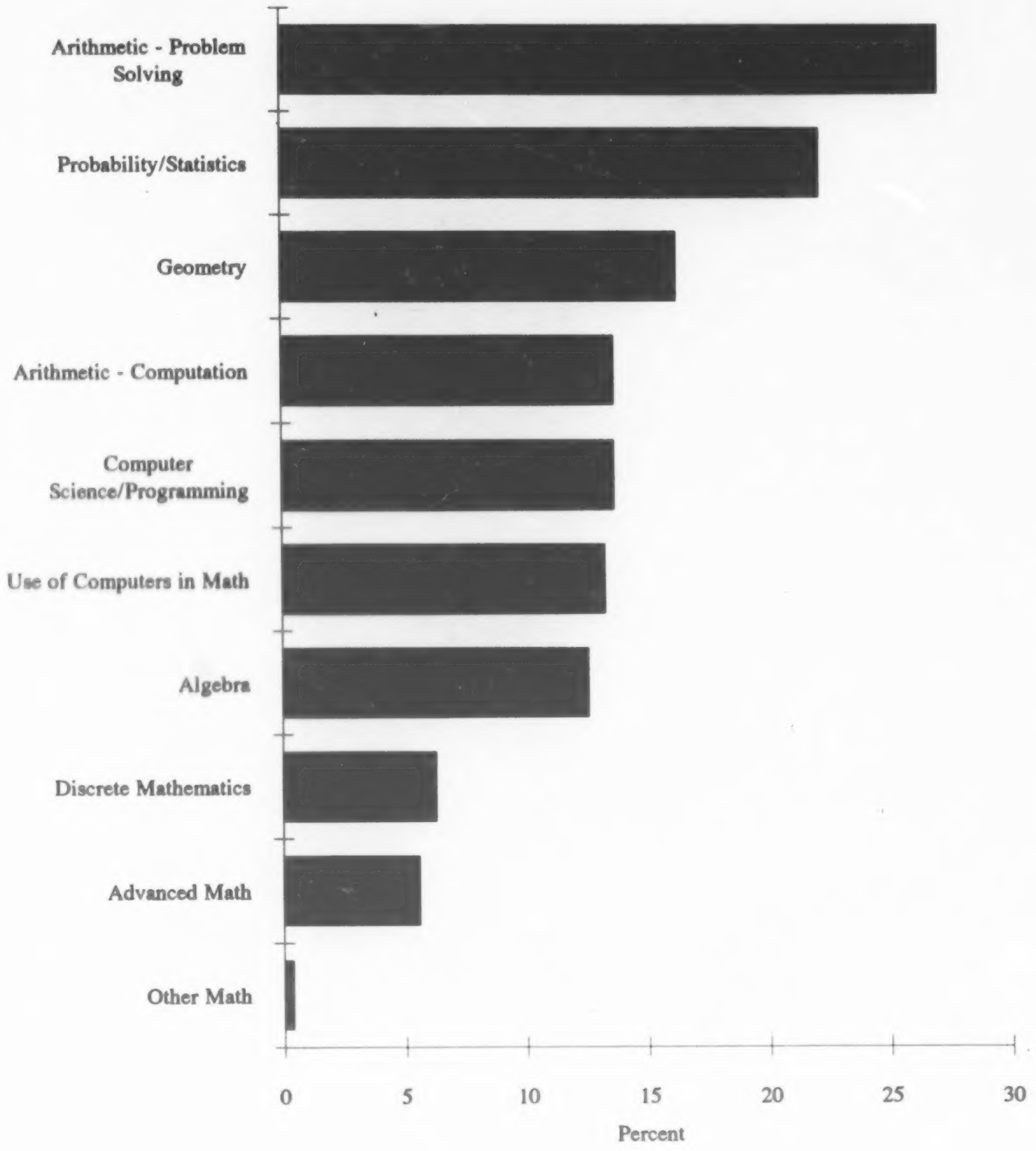
Source: Participant Survey - Item 2

Figure 7.18A - PI Reported Areas of Mathematics Receiving Major Emphasis in TEP Projects: Middle School/Jr. High Level



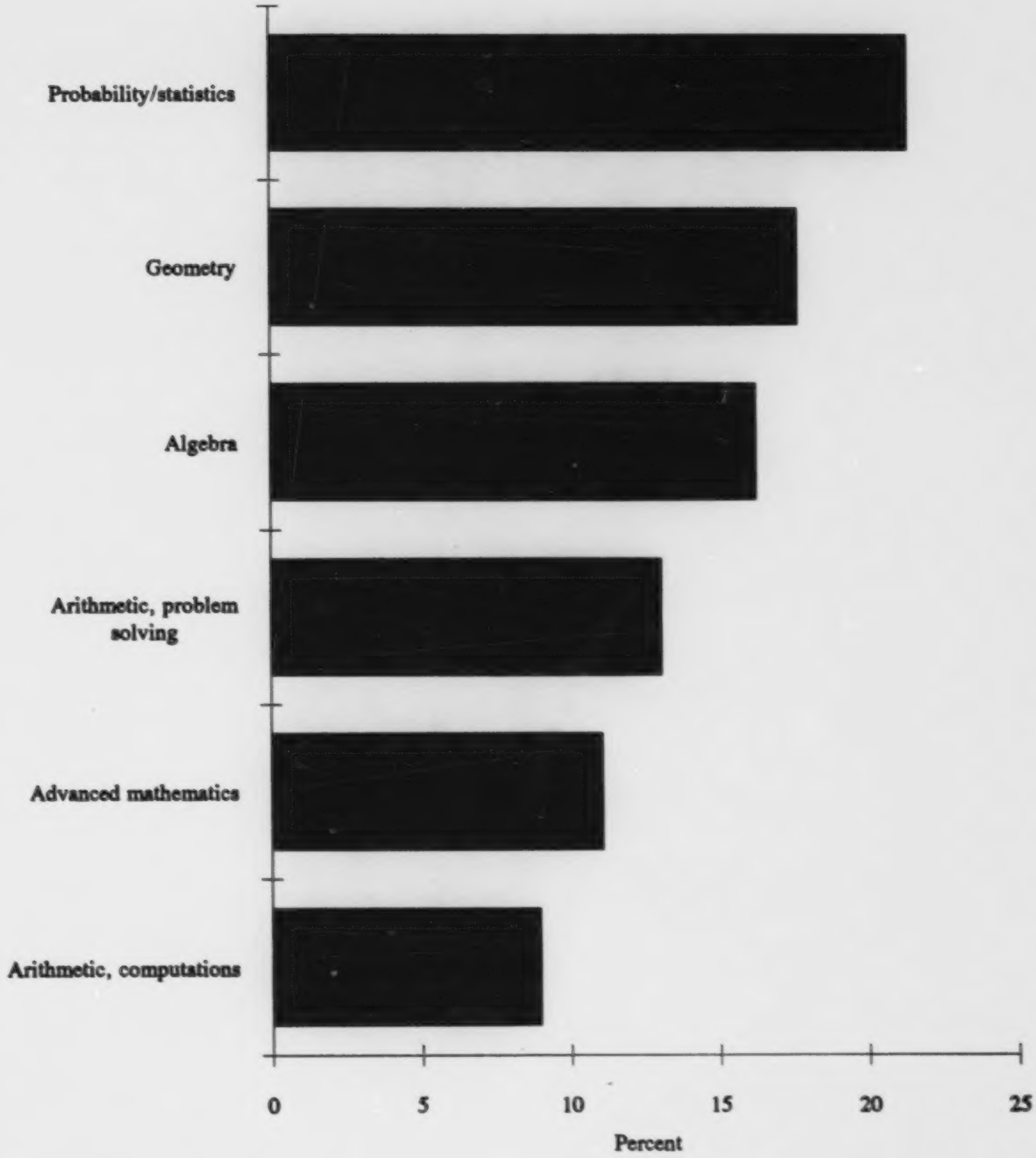
Source: PI Survey - Item 15

Figure 7.18B - Participant Reported Areas of Mathematics Receiving Major Emphasis in TEP Projects: Middle School/Junior High



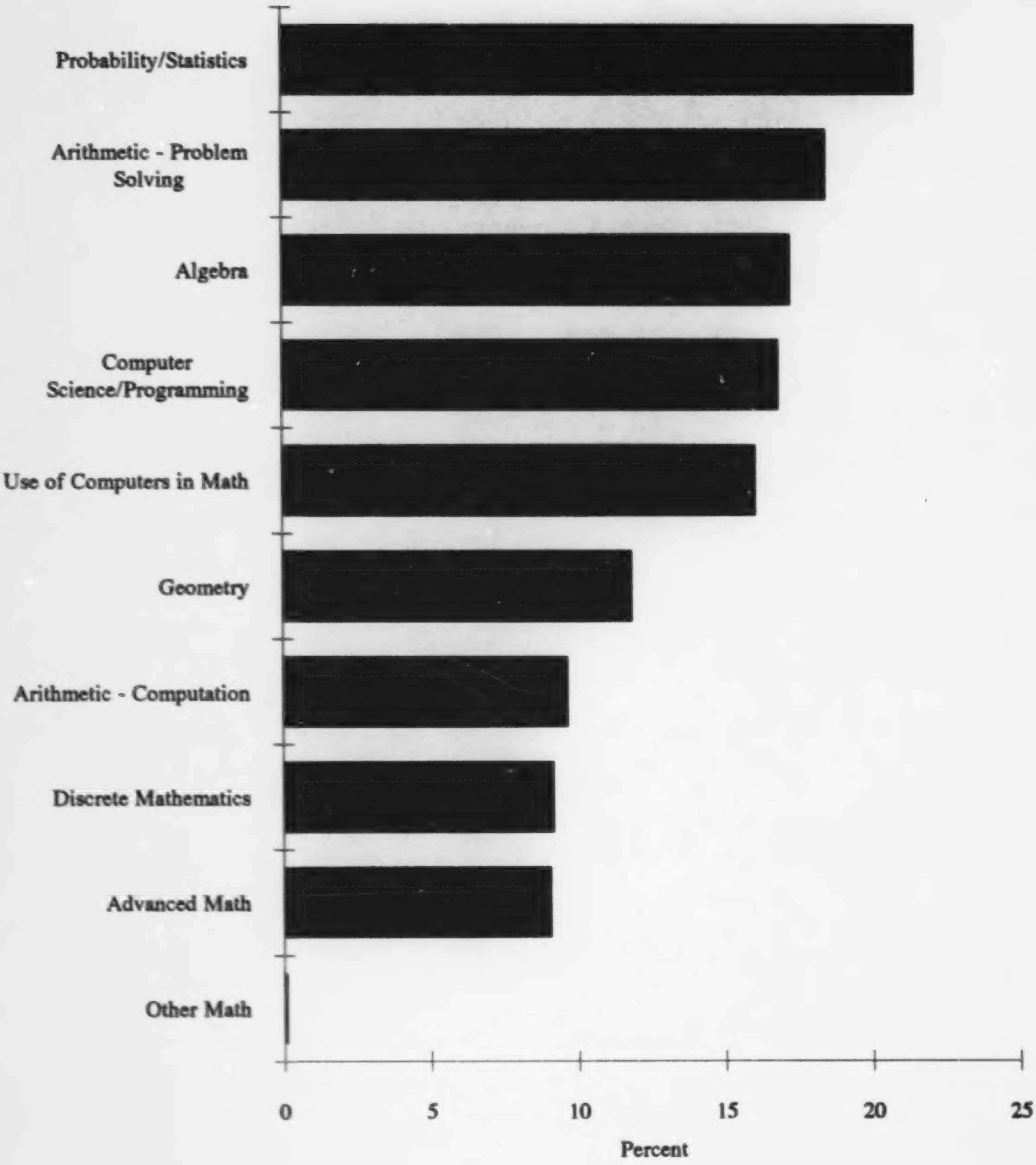
Source: Participant Survey - Item 4

Figure 7.19A - PI Reported Areas of Mathematics Receiving Major Emphasis in TEP Projects: High School



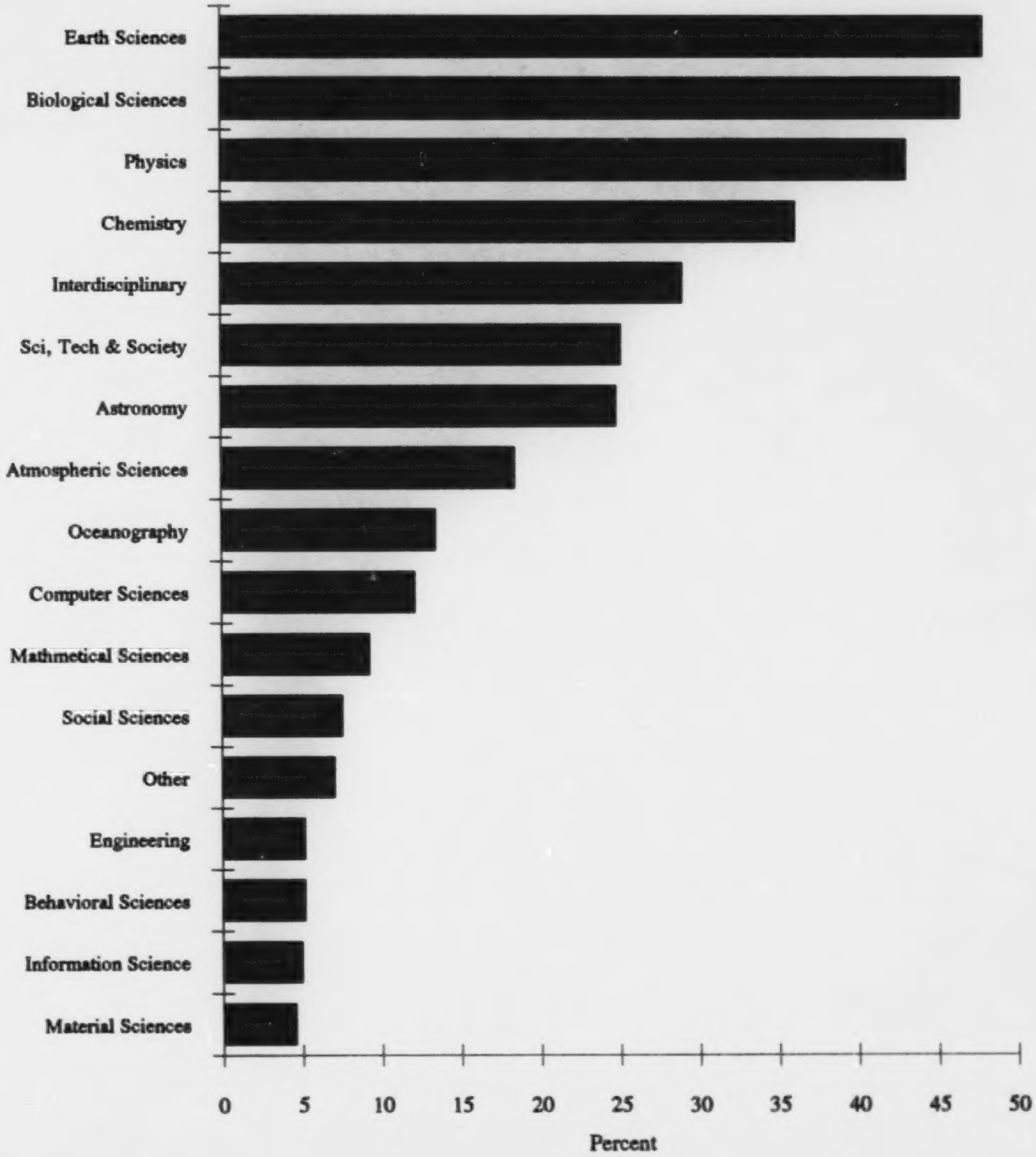
Source: PI Survey - Item 15

Figure 7.19B - Participant Reported Areas of Mathematics Receiving Major Emphasis in TEP Projects: High School



Source: Participant Survey - Item 4

Figure 7.20A - PI Reported Areas of Science Receiving Major Emphasis in TEP Projects: Elementary School Level



Source: PI Survey - Item 15

received the least emphasis at the elementary level, according to PIs, were material sciences (4.6%), information science (5.0%), and behavioral sciences (5.2%).

TEP participants, as seen in Figure 7.20B, reported many of the same areas of science as the PIs but in different rank order. According to participants, the most frequently emphasized areas of science at the elementary school level are the biological sciences (42.6%), physics (31.4%), and geology (25.1%). Participants also cited information science (19.4%) as an area of science receiving major emphasis while only 5.0 percent of PIs did so.

Middle School

As shown in Figure 7.21A, according to PIs, the most frequently emphasized areas of science at the middle school level included the biological sciences (44.4%), earth science (41.5%), physics (35.2%), and chemistry (32.4%). The areas of science receiving the least emphasis at the middle school level, according to participants, include information science (2.9%), behavioral science (3.0%), and material science (4.3%).

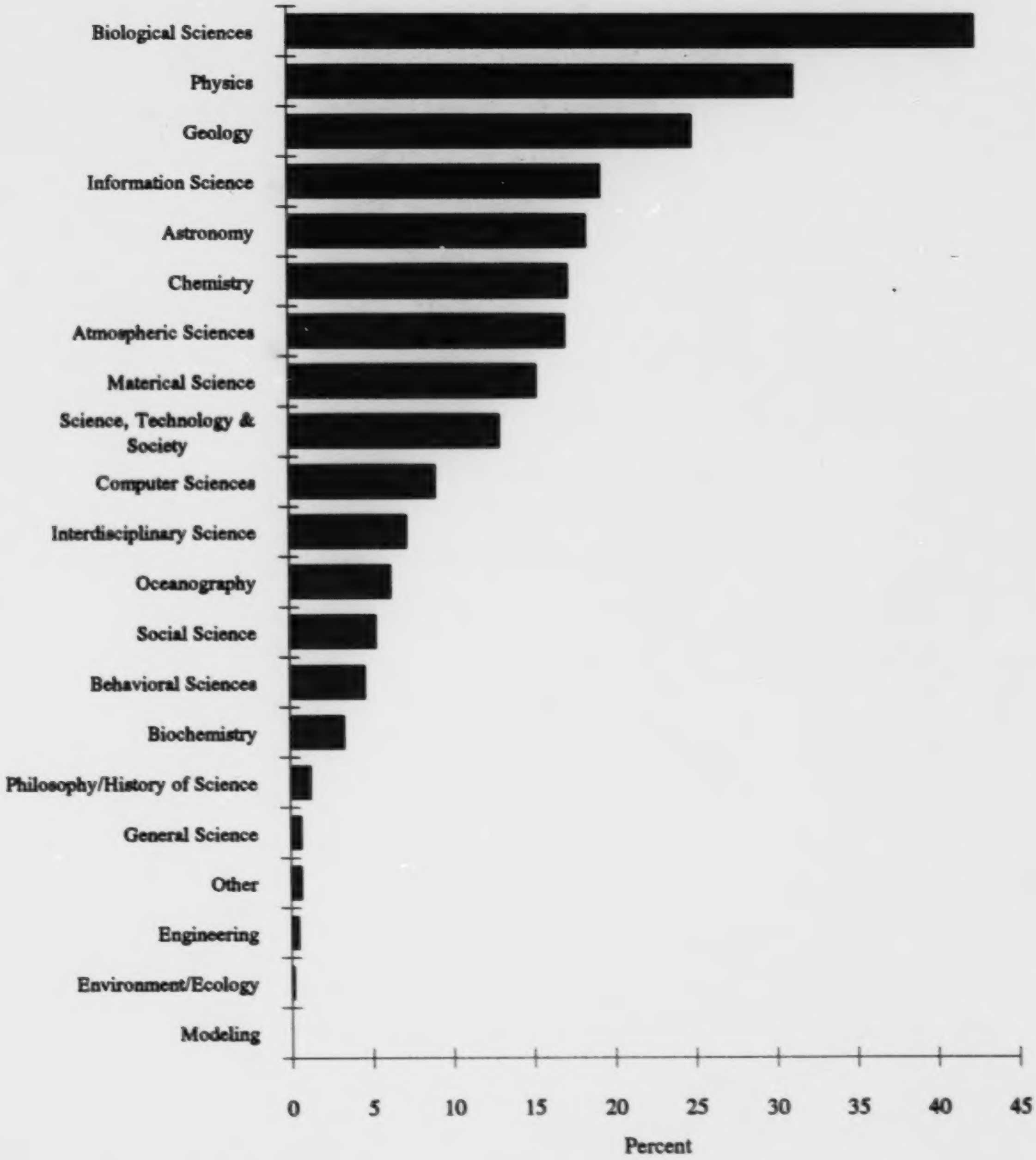
TEP participants, as seen in Figure 7.21B, generally agreed with PIs on the areas of science receiving major emphasis in TEP projects at the middle school and junior high levels. Participants reported that the biological sciences (31.8%), geology (24.5%), physics (24.1%), and chemistry (23.9%), were the most emphasized areas of science in their projects.

Senior High School

As shown in Figure 7.22A, according to the PIs, the most frequently emphasized areas of science at the high school level included the biological sciences (41.9%), physics (37.5%), chemistry (35.0%), and earth science (24.1%). PIs cited information science (1.1%), and material science (3.1%), as the areas of science receiving the least emphasis at the high school level.

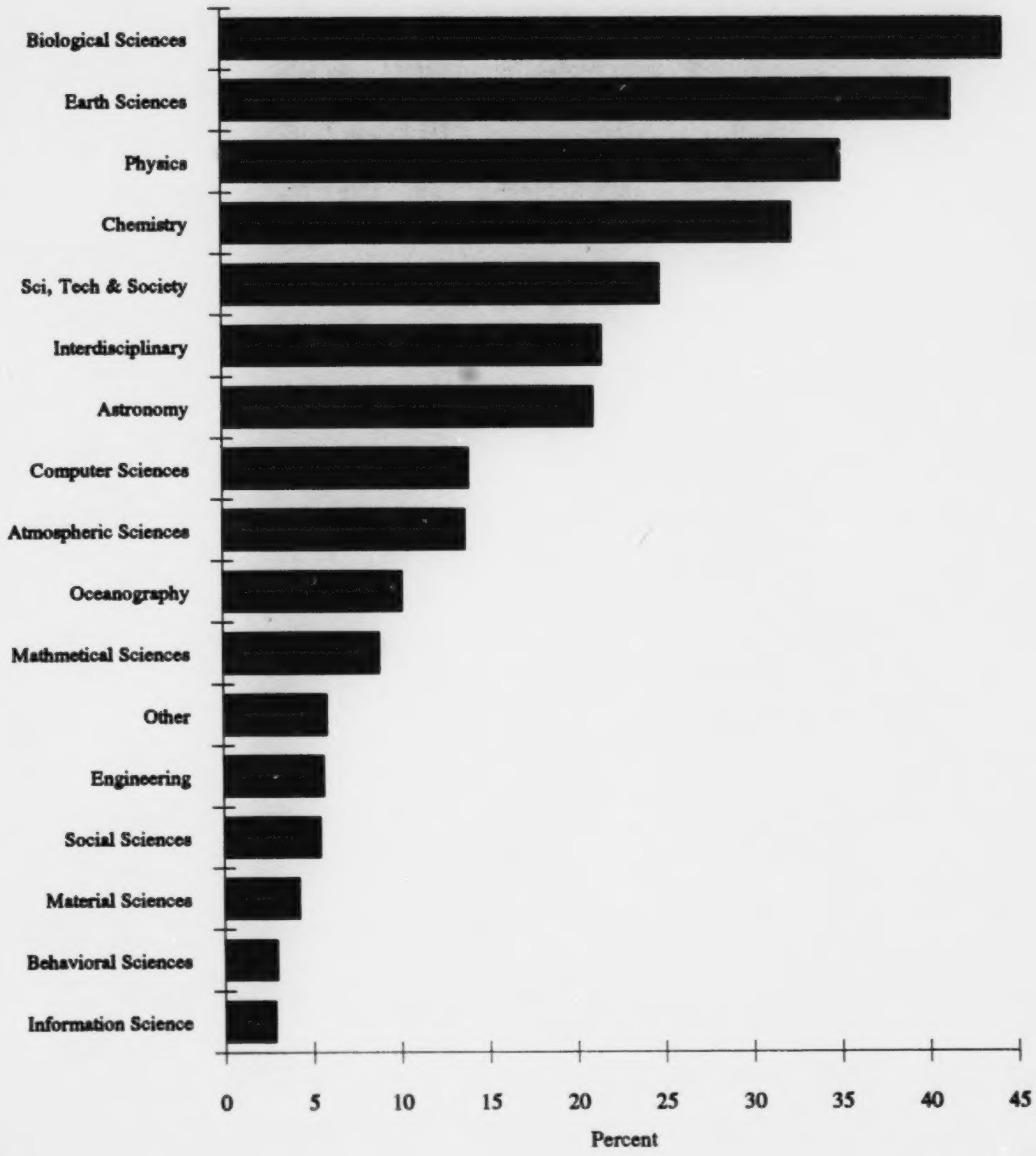
TEP participants, as seen in Figure 7.22B, agreed with PIs that chemistry (31.7%), and biology (26.0%) were major areas of emphasis for high school level science projects. However, participants were more likely to also cite Science, Technology, and Society (STS) subjects (25.9%), and physics (23.8%), and less likely to cite geology (6.4%) as major areas of science than PIs.

Figure 7.20B - Participant Reported Areas of Science Receiving Major Emphasis in TEP Projects: Elementary School Level



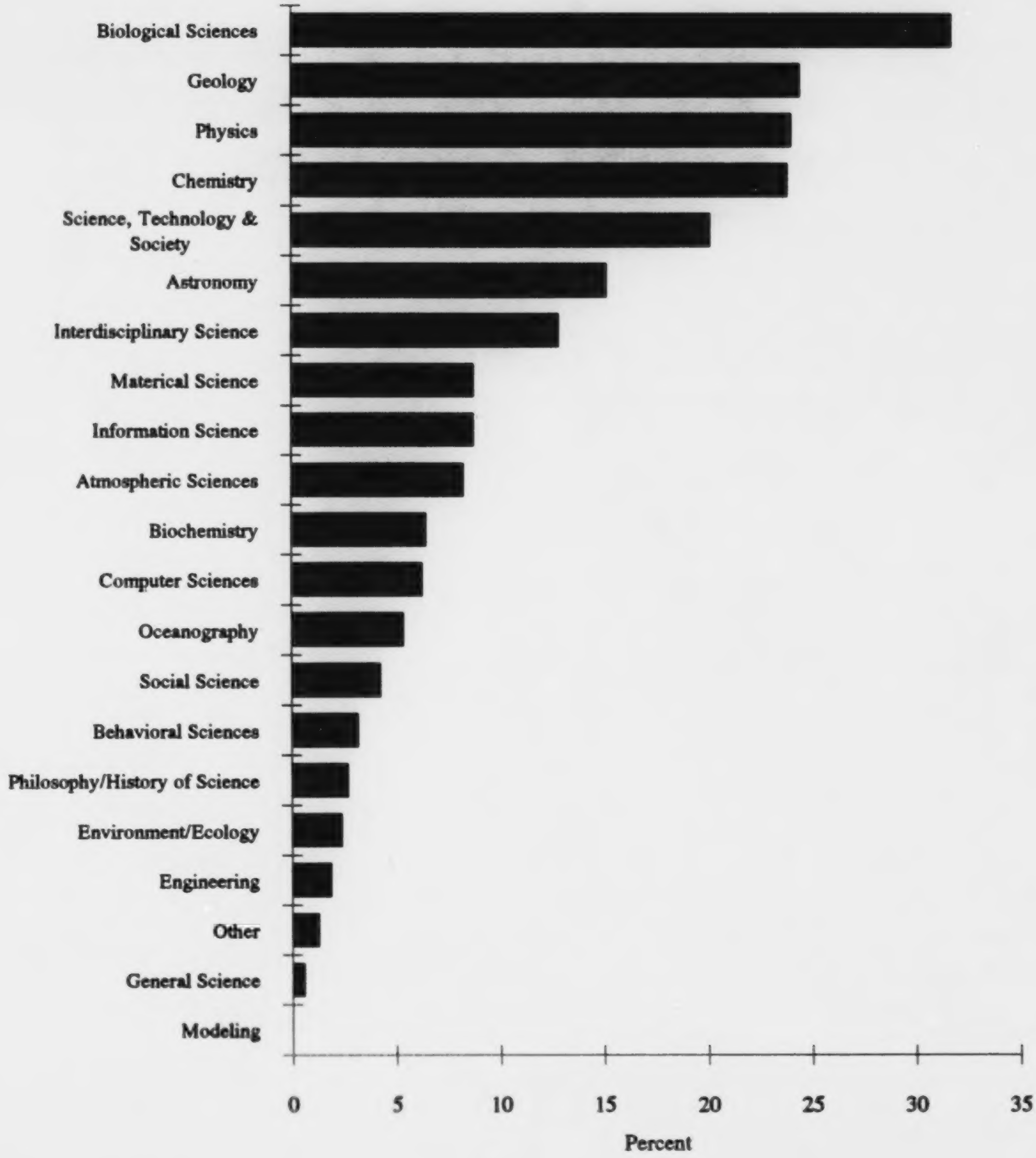
Source: Participant Survey - Item 4

Figure 7.21A - PI Reported Areas of Science Receiving Major Emphasis in TEP Projects: Middle School/Junior High



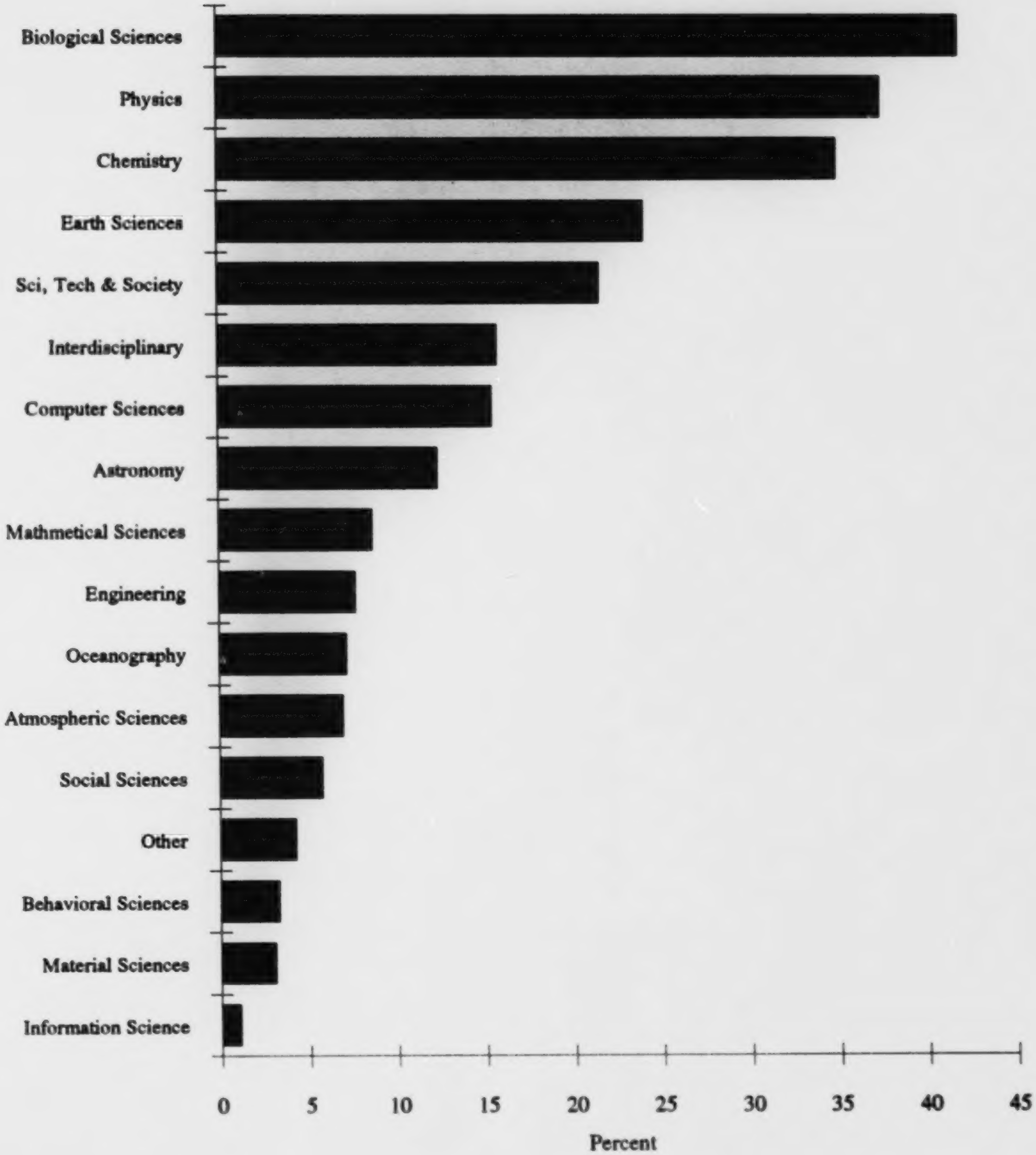
Source: PI Survey - Item 15

Figure 7.21B - Participant Reported Areas of Science Receiving Major Emphasis in TEP Projects: Middle School/Junior High



Source: Participant Survey - Item 4

Figure 7.22A - PI Reported Areas of Science Receiving Major Emphasis in TEP Projects: High School Level



Source: PI Survey - Item 15

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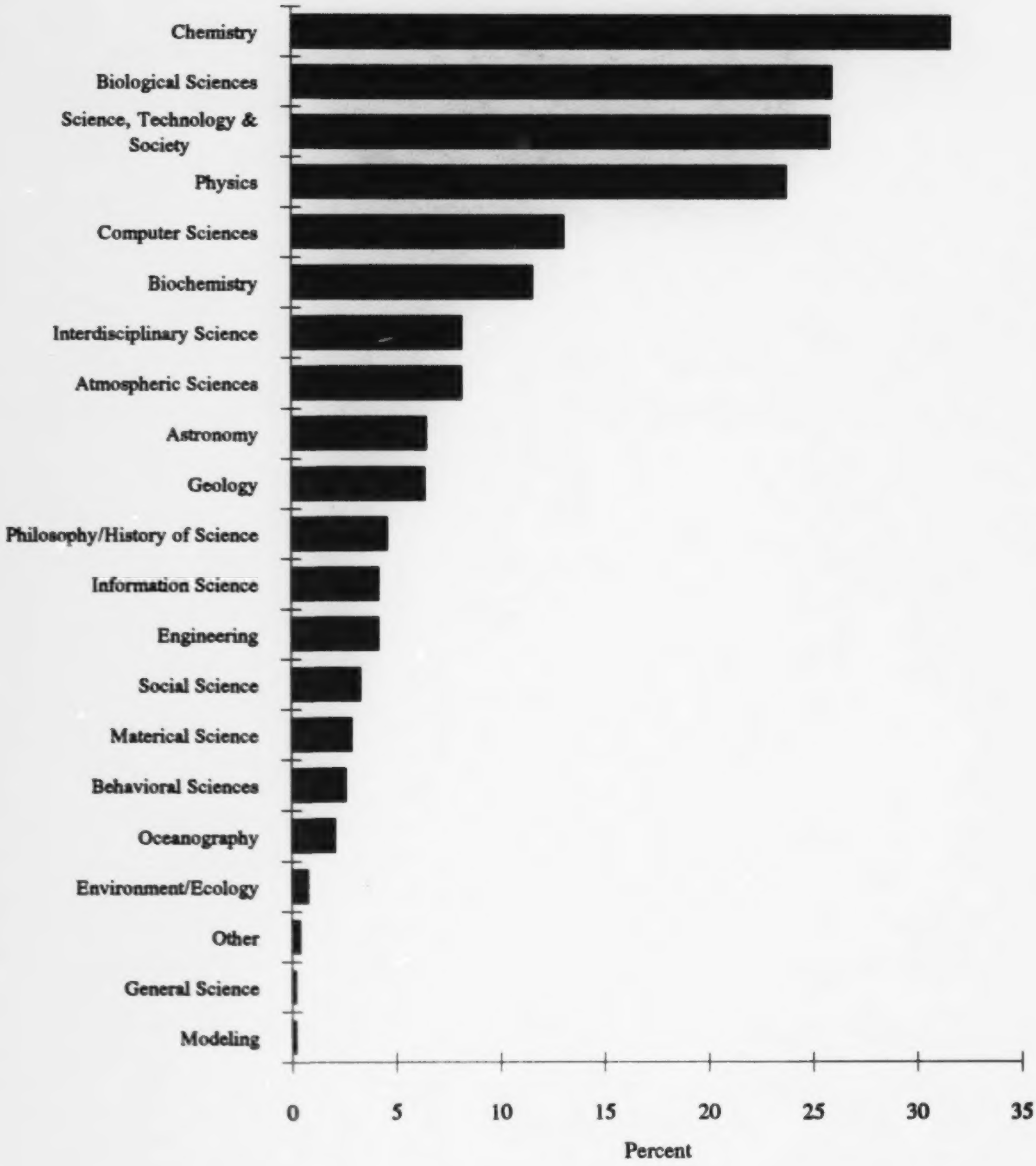
Figure 7.22B - Participant Reported Areas of Science Receiving Major Emphasis in TEP Projects: High School Level



Source: Participant Survey - Item 4

7.6 *General Teaching Emphases*

In order to gain a broader perspective on the distribution of overall approaches to instructional methods used, PIs were first asked to indicate the percentage of contact hours in which lecture, hands-on, or other instructional methods were used. As seen in Figure 7.23A, the majority of contact hours were devoted to hands-on activities (58%). Lectures accounted for 28 percent of the contact hours, while 13 percent of the time went to other instructional methods. Over time, the percentage of time used for hands-on instruction remained consistently high while the percentage of time used for lecturing decreased slightly.

As seen in Figure 7.23B, the breakdown of contact hours by instructional methods reported by PIs was confirmed by TEP participants. According to participants, the majority of contact hours were devoted to hands-on activities (53.7%). Lectures accounted for 36.1 percent of all contact hours, while 8.4 percent of the time went to other instructional methods. Over time, the general trend indicates that the percentage of time used for hands-on instruction is gradually increasing.

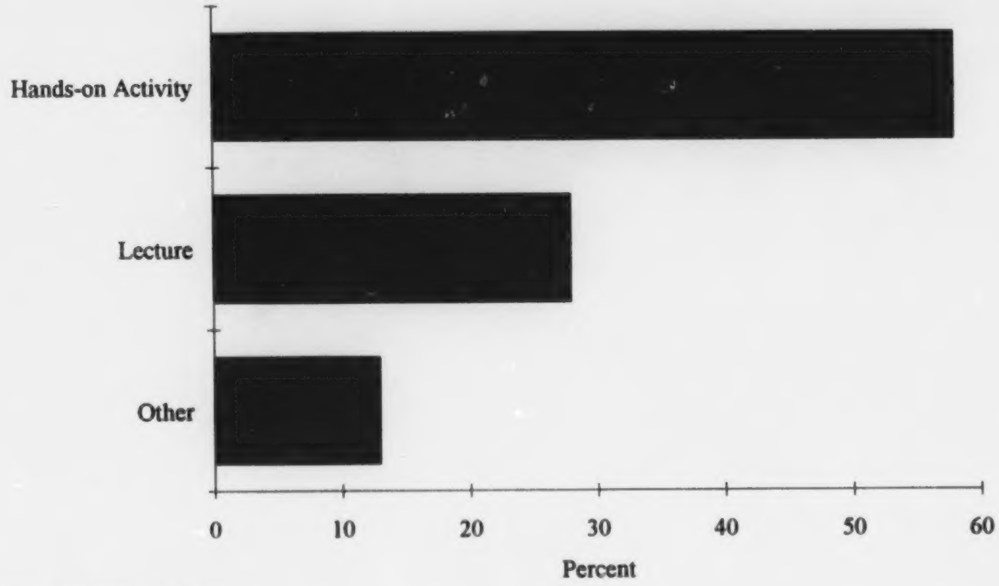
7.7 *Instructional Methods and Materials Employed*

Given that a wide variety of methods and materials might be employed among the TEP projects, PIs were also asked to indicate what methods and materials were used often or sometime, and what methods they did not use at all. As shown in Figure 7.24A, the instructional methods used most often by PIs were teaching through the use of hands-on activities (85.7%), small group discussions (45.4%), and the development of student instructional materials (43.6%). Other teaching methods used somewhat less frequently included cooperative learning groups, lectures, use of resource people, instructor demonstrations, peer teaching, field trips, and examination of instructional resources. Computer aided instruction was used often by only 8.2 percent of PIs and not used at all by 57.3 percent of all projects.

A higher percentage of PIs have reported peer teaching and the examination of instructional resources as instructional methods that they have used often. Fewer PIs reported lecturing and library research as instructional techniques they often use.

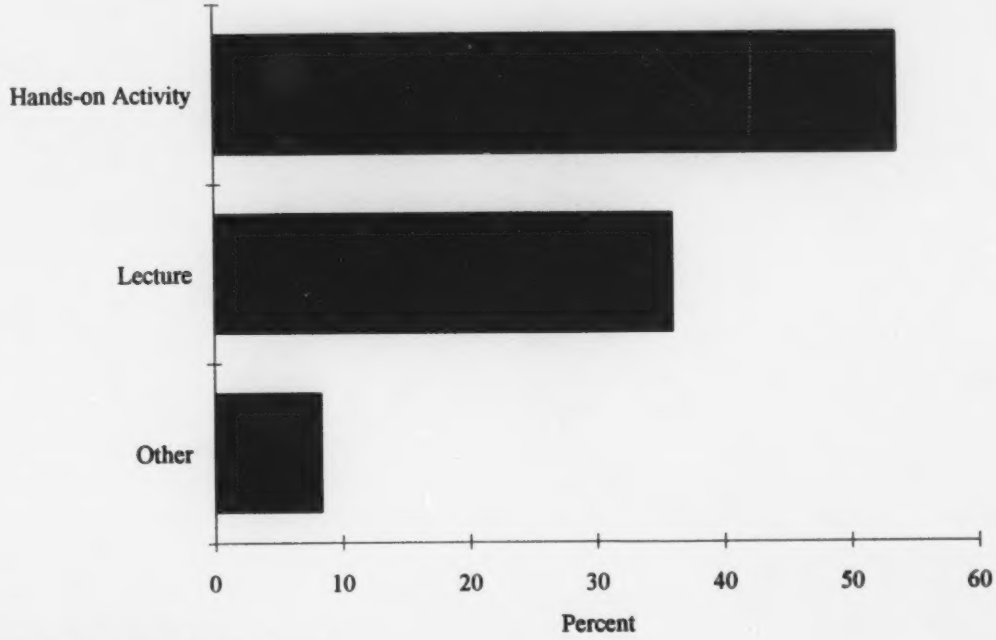
TEP participants were also asked about the instruction methods and materials used in the TEP project. As seen in Figure 7.24B, participants confirmed that hands-on activities are the most often used method in TEP projects; 77.4 percent of participants reported that hands-on

Figure 7.23A - PI Reported Distribution of Contact Hours, by Instruction Method



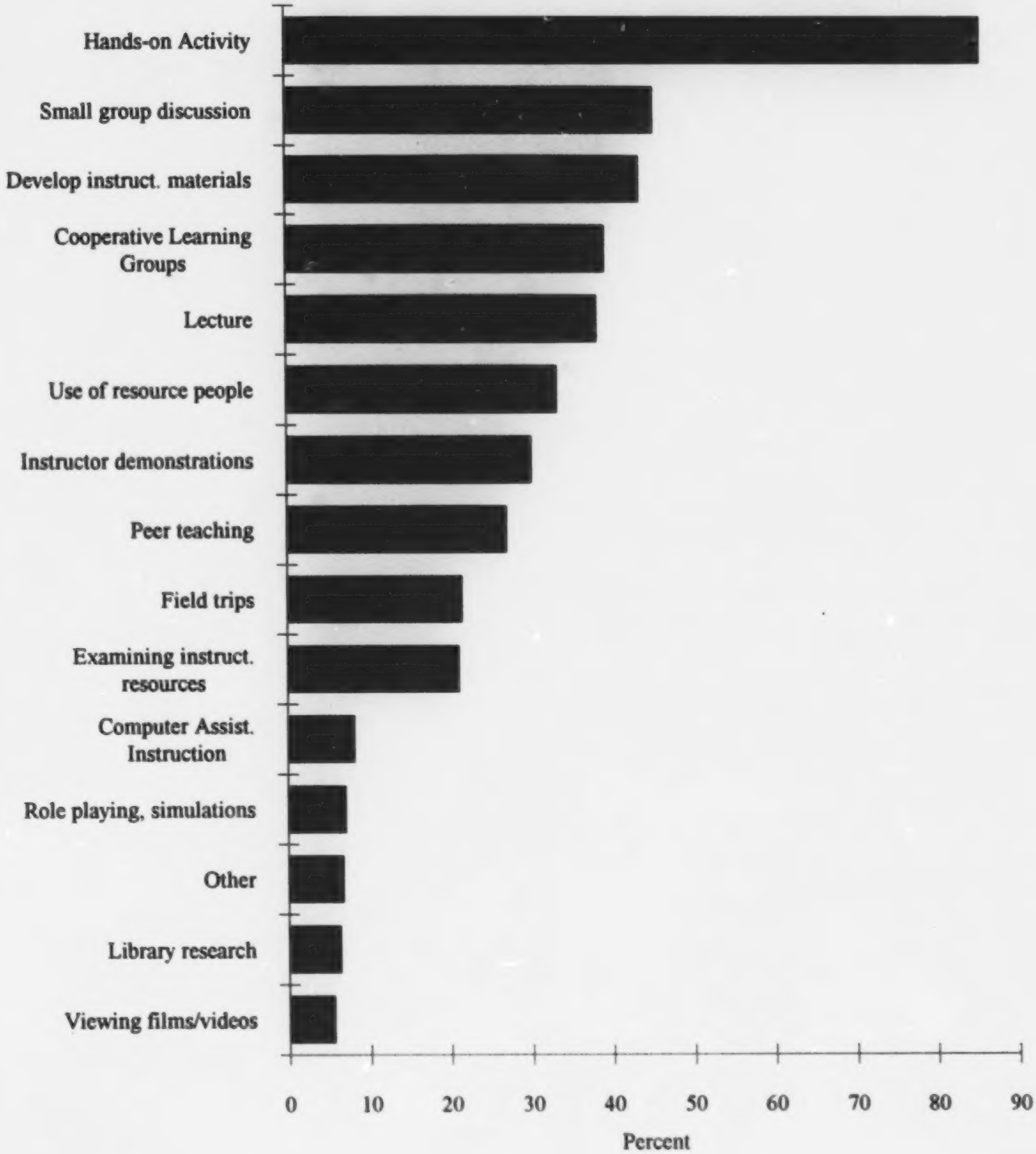
Source: PI Survey - Item 16

Figure 7.23B - Participant Reported Distribution of Contact Hours, by Instruction Method



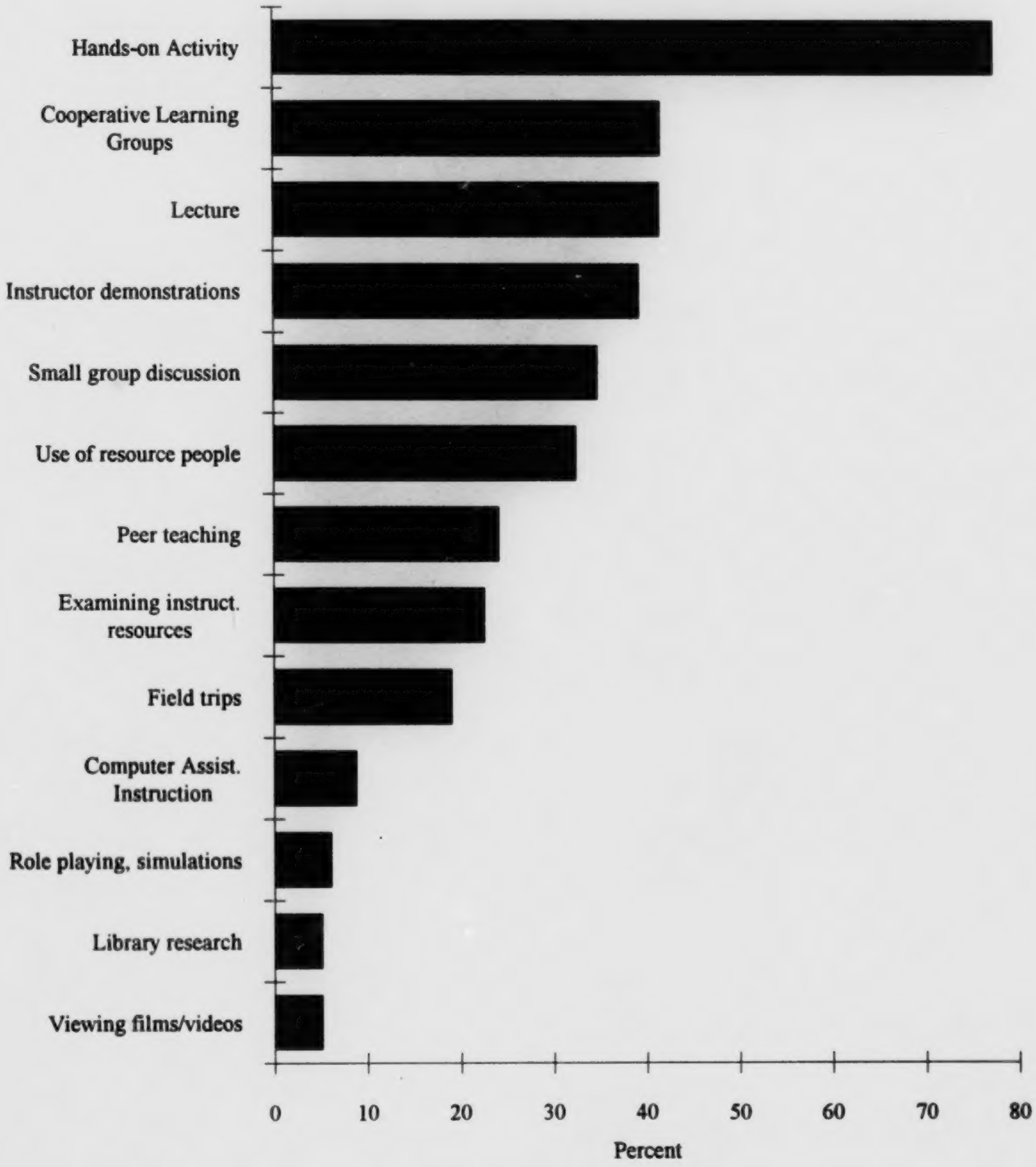
Source: Participant Survey - Item 5

Figure 7.24A - PI Reported Instructional Methods and Materials Used in TEP Project, by Award Cohort



Source: PI Survey - Item 17

Figure 7.24B - Participant Reported Instructional Methods and Materials Used in TEP Project



Source: Participant Survey - Item 6

activities were used often in their projects. Other teaching methods used, according to participants, include cooperative learning groups (41.6%), lectures (41.5%), instructor demonstrations (39.3%), and small group discussion sections (34.8%).

7.7.1 Frequency and Level of Curricula Materials Development

Each PI was asked whether or not instructional materials were developed as a part of his or her project. Seventy-five percent of Principal Investigators reported that student curriculum materials were developed as part of their projects. As shown in Figure 7.25, the percentage of projects that developed instructional materials ranged from 68.6 percent in 1987 to 80.3 percent in 1984; there was no apparent trend in the percentage of projects developing instructional materials.

PIs reporting that they developed instructional materials were also asked to indicate the grade levels for which these materials were appropriate. As shown in Figure 7.26, the majority of materials were developed for the middle/junior high (62.2%), and senior high (61.8%) grade levels. Instructional materials suited for elementary school and kindergarten teaching were created by 36.4 percent and 17.2 percent of all projects, respectively.

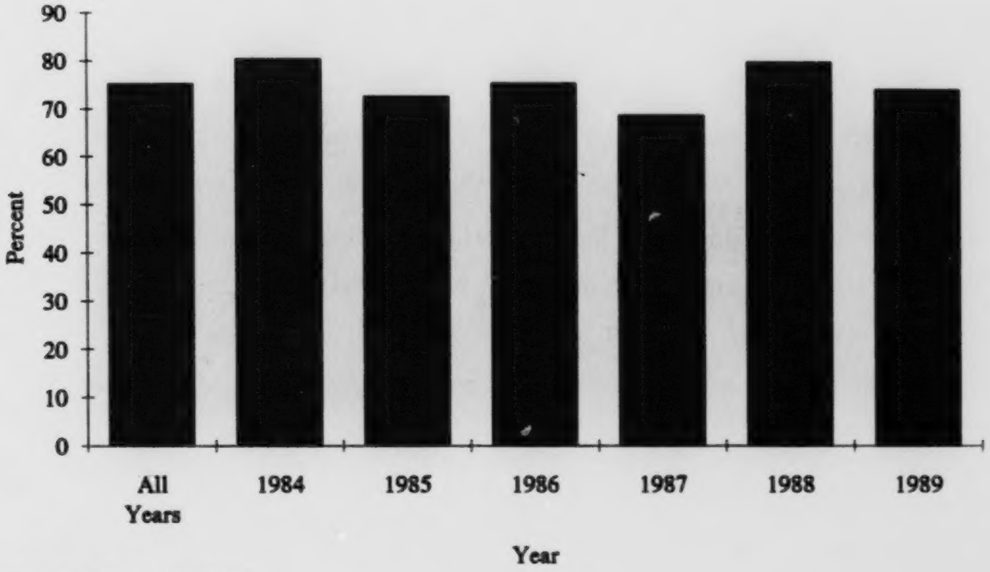
7.7.2 Types of Materials Developed

All PIs who developed instructional materials were asked to comment on the materials they developed. More than half (51.1%) of the projects that reported developing instructional materials produced a classroom unit, a teaching unit or syllabus, or a related piece of work. Other frequently reported materials included guides on instrumentation or methods for the physical sciences (27.8%) and laboratory materials (23.5%).

7.7.3 Contributors to Materials Development

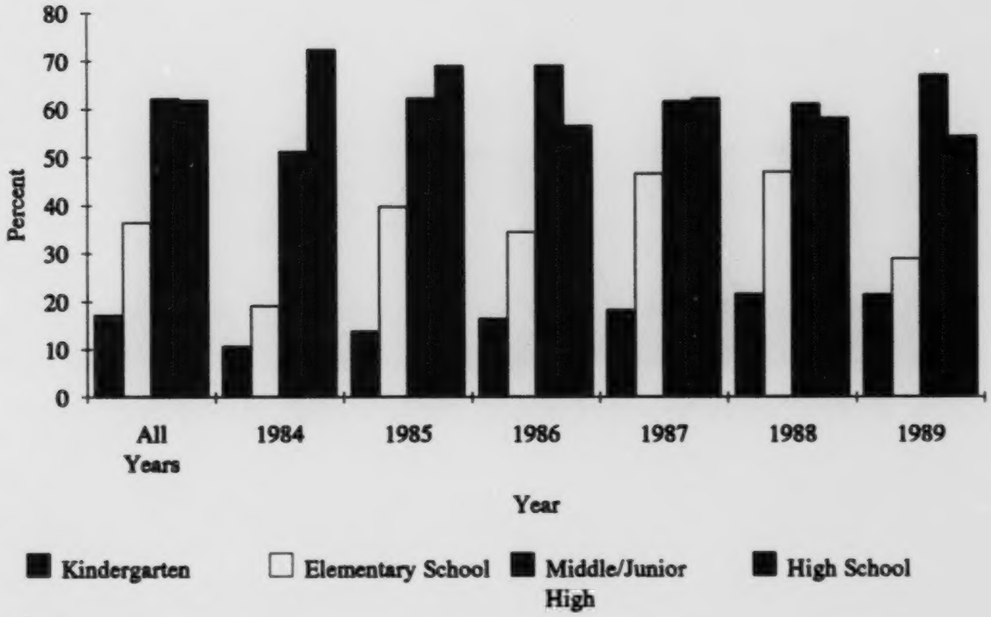
A further consideration explored concerned who was involved in the development of these materials -- the participants themselves, principal investigators, other project staff, and outside specialists. Responses could vary from no involvement whatsoever, to heavy involvement. As seen in Figure 7.27A, 80 percent of the PIs who developed materials reported heavy involvement of the teacher participants. Project staff other than the Principal Investigator

Figure 7.25 - Development of Instructional Materials by TEP Projects, by Award Cohort



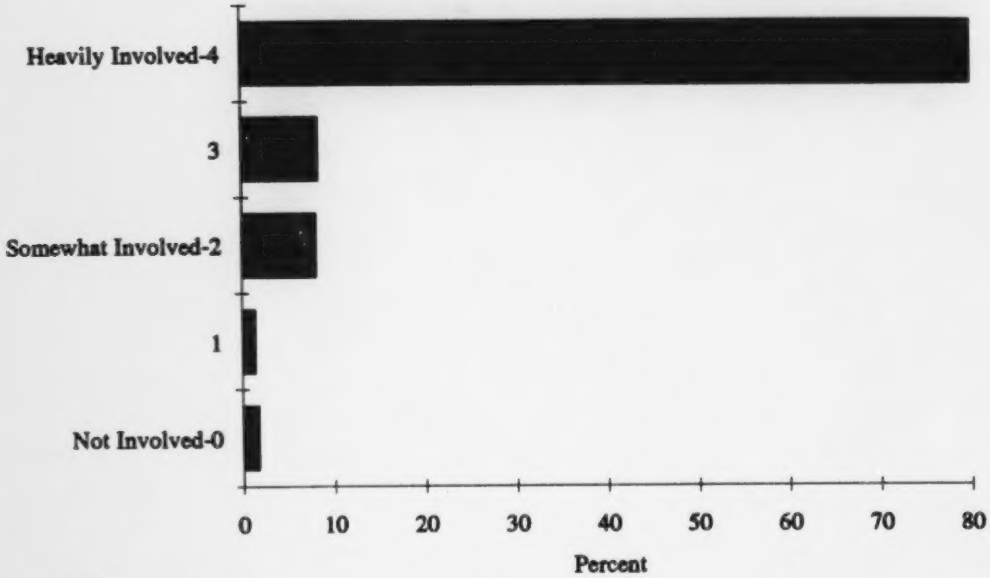
Source: PI Survey - Item 18

Figure 7.26 - School Levels for Which Instructional Materials were Developed, by Award Cohort



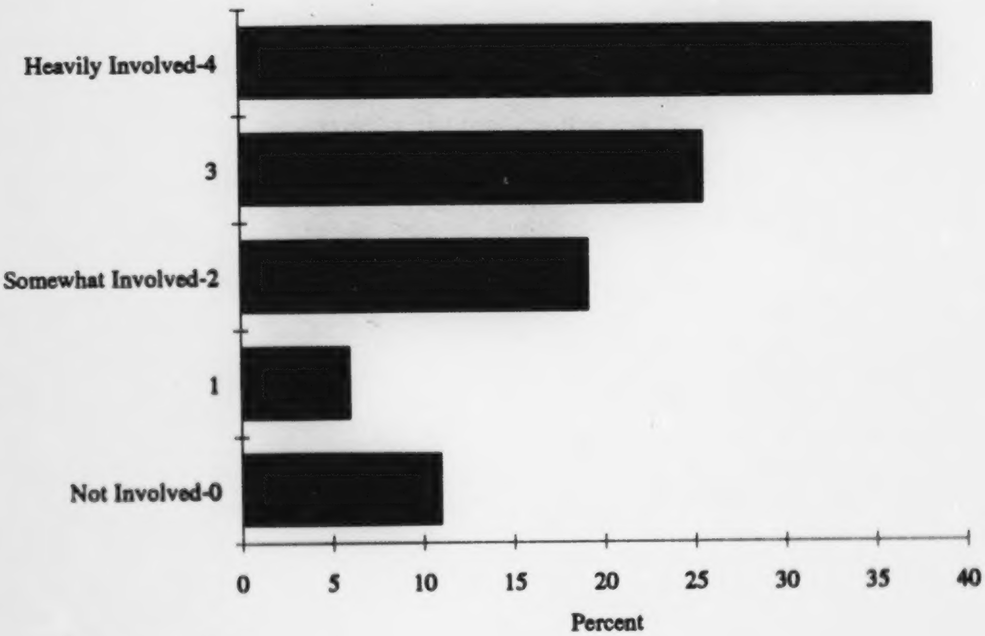
Source: PI Survey - Item 18

Figure 7.27A - Teacher Participant Involvement in Development of Curricula Materials



Source: PI Survey - Item 19

Figure 7.27B - Principal Investigator Involvement in the Development of Curricula Materials



Source: PI Survey - Item 19

were heavily involved in half of all projects that developed curricula materials (see Figure 7.27C); PIs considered themselves heavily involved in 38.3 percent (see Figure 7.27B). Over time, the participants, the PI, outside specialists, and other project staff were all reported as being slightly more involved with the development of instructional teaching materials.

7.7.4 Outside Reviews of Materials

An important consideration of such development activity involves review of the content of materials in order to insure accuracy and quality. As shown in Figure 7.28, seventy-eight percent of PIs whose projects involved the development of curriculum materials indicated that these materials were reviewed by outside experts in the relevant disciplines.

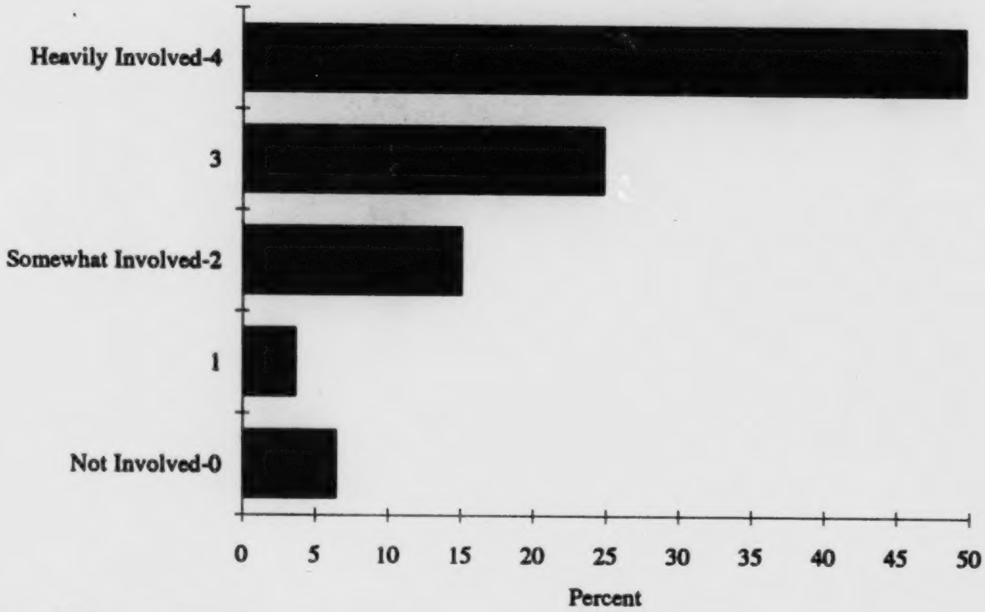
7.8 Dissemination of Materials Developed by Projects

PIs who reported the development of curriculum materials were asked to report how these materials were disseminated. As shown in Figure 7.29, the most likely forms of dissemination were use by participating teachers (99.1%), having participants share the materials with other teachers from their school system (88.2%), presenting the materials at in-service workshops or professional conferences (79.6%), and sharing materials with teachers from different system (62.3%). The means of distributing the materials developed by projects did not change significantly over time.

7.9 Course Credits Toward Advanced Degrees

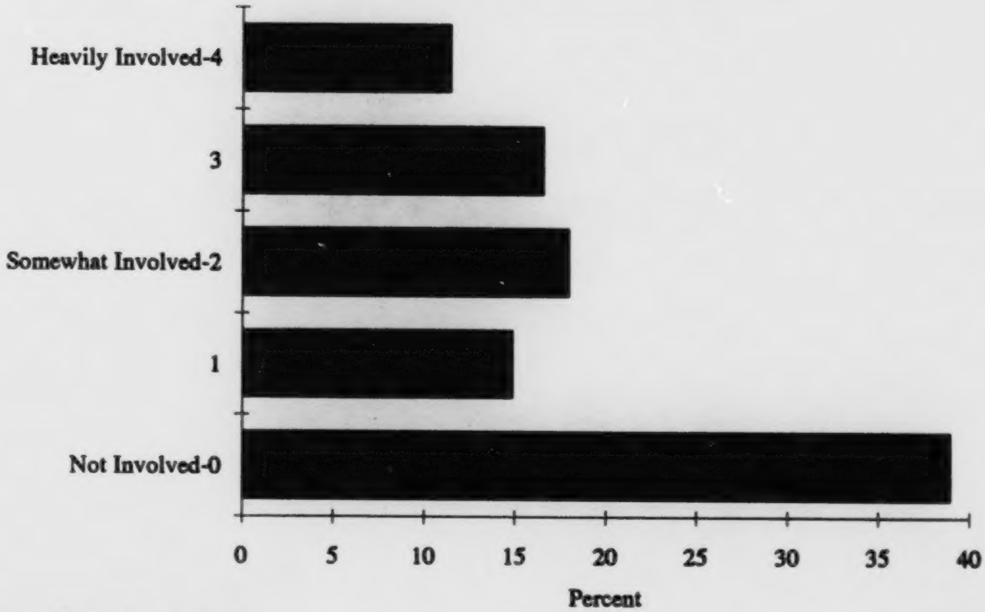
A final concern was with whether or not participants were able to earn credit toward an advanced degree. It would seem reasonable to expect that the offering of such credits would elevate the attractiveness of participation in a TEP project -- both in terms of a participant viewing the project as being "serious", and in terms of assisting them to attain an advanced degree if they were so inclined. As seen in Figure 7.30, the majority (78.7%) of TEP projects gave formal credit toward an advanced degree. The percentage of TEP projects giving such credit ranged from 74.4 percent to 85.7 percent.

Figure 7.27C - Other Project Staff Involvement in the Development of Curricula Materials



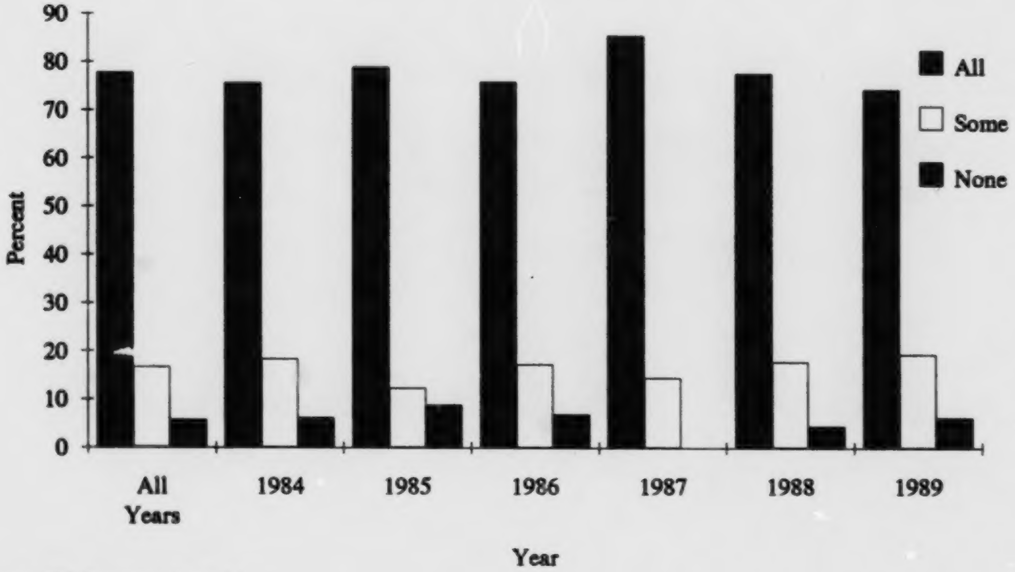
Source: PI Survey - Item 19

Figure 7.27D - Outside Specialist Involvement in the Development of Curricula Materials



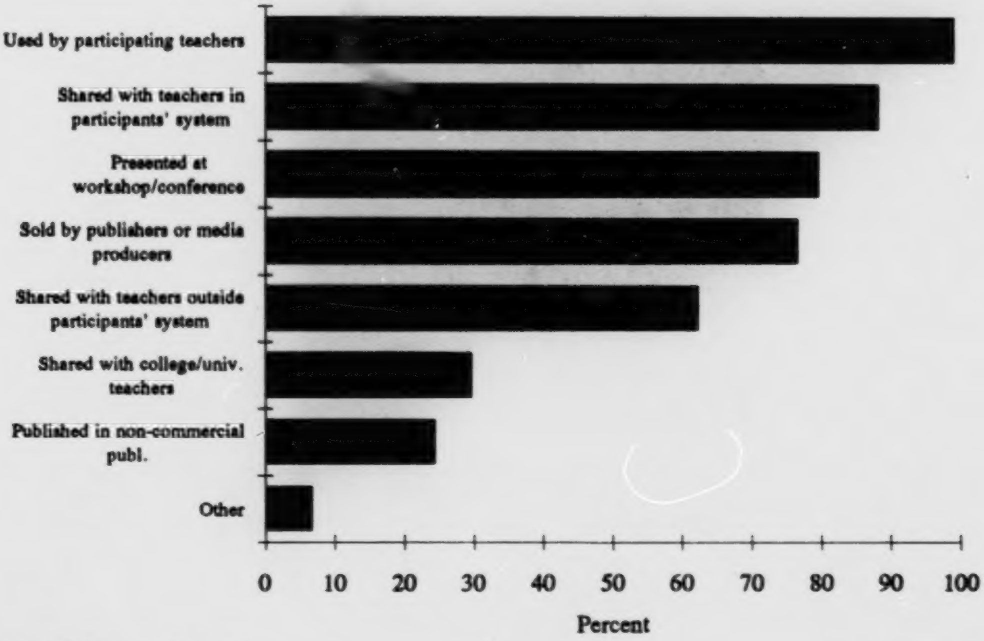
Source: PI Survey - Item 19

Figure 7.28 - Review of Materials for Content Accuracy, by Award Cohort



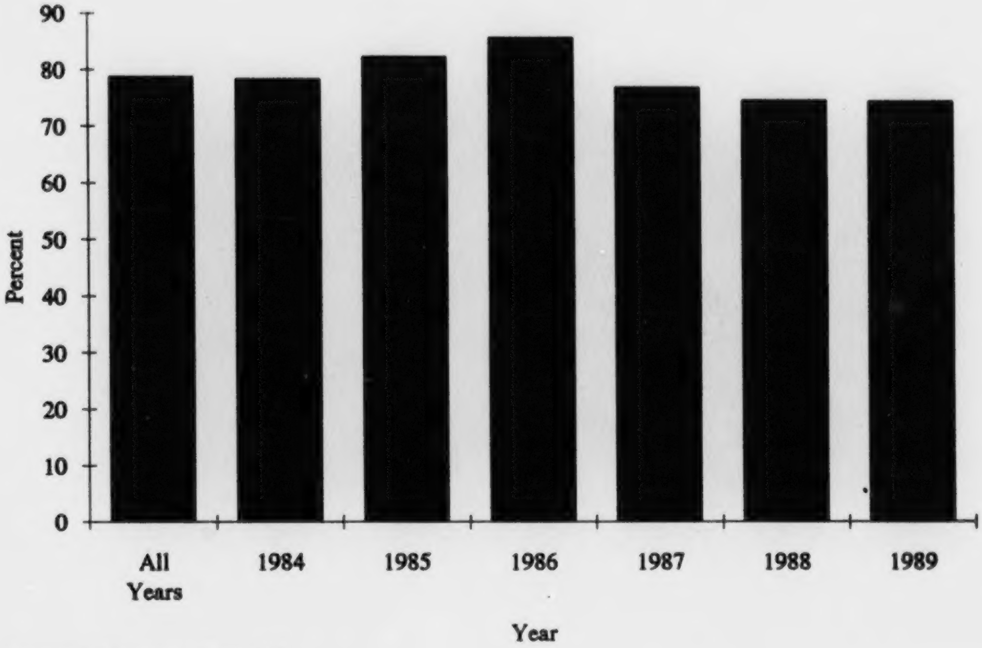
Source: PI Survey - Item 20

Figure 7.29 - How PIs Disseminated Material Developed in Their Projects



Source: PI Survey - Item 21

Figure 7.30 - Percentage Reporting Granting of Course Credit to Participants, by Award Cohort



Source: PI Survey - Item 14B

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PART FOUR

ASSESSMENTS OF TEP PROJECTS

8.0 PROJECT OUTCOMES AND IMPACTS

Assessments of TEP projects are examined from a variety of perspectives. First, the question of the use of evaluations by the PIs themselves are documented. Next, assessments by PIs and participants of the usefulness of the various instructional materials and methods is documented. Immediately following this, the assessments of both PIs and participants of the overall project outcomes are presented.

Before examining secondary impacts of participation in the TEP project, the present setting and teaching activities of participants are documented; in particular, situations in which the TEP participants are now teaching in other school districts, at different grade levels, or with other job responsibilities must be understood (as this could be expected to either reflect or mediate the impacts). The extent to which TEP participants are working with other science and mathematics resources is first documented. We then proceed to examine the usefulness of the TEP experience in terms of applications to teaching methods and materials. Following this the participants estimate the changes (if any) that they see in their students' learning of science and mathematics materials, and the extent to which they believe that such changes relate in any way to their TEP participation.

Two final issues are addressed. First, what is the situation with respect to school district policies and programs in science and mathematics, and what barriers do they perceive in their districts to improvement in science and mathematics teaching. Second, a variety of issues concerning educational administration activities of TEP participants are explored.

8.1 Project Evaluations and Assessments

When PIs originally submitted their applications for a TEP award to NSF, they were asked to indicate whether or not they had included some form of a research component that would involve data collection. The questionnaire requested that PIs indicate whether they had done so (irrespective of whether this was originally planned or not). In addition, where such data were gathered, PIs were asked to indicate whether this was done so by project staff, or by an outside evaluator. Across all years, 75.5 percent of PIs reported that their project included a research component with data collection. A majority of PIs (70.1%) reported that some form of data collection had been undertaken by the project staff, while just over a quarter (27.2%) reported that project data had been collected by an outside evaluator.

The most likely gatherers of evaluation data were the project's staff. The percentage of projects that utilized project staff to collect data increased over time from 61.3 percent in 1984 to 74.6 percent in 1989. The percentage of projects that utilized outside evaluators to collect data greatly increased over time, from 12.9 percent in 1984 to 40.1 percent in 1989.

Looking at the individual data gathering procedures involved, as seen in Figure 8.1, the evaluation procedures used most frequently by either project staff or outside evaluators, were determining participants' ratings or evaluation of the project (72.9%), evaluating participant interest, confidence, or other attitudes (54.6%), and reviewing participants' records of their use of project-taught methods or materials in their classrooms (53.0%). Over time, the percentage of PIs reporting the use of each method for data collection increased steadily. For example, in 1984 only 8.1 percent of all projects used any measure of student learning of science or mathematics, but by 1989, 22.1 percent were doing so.

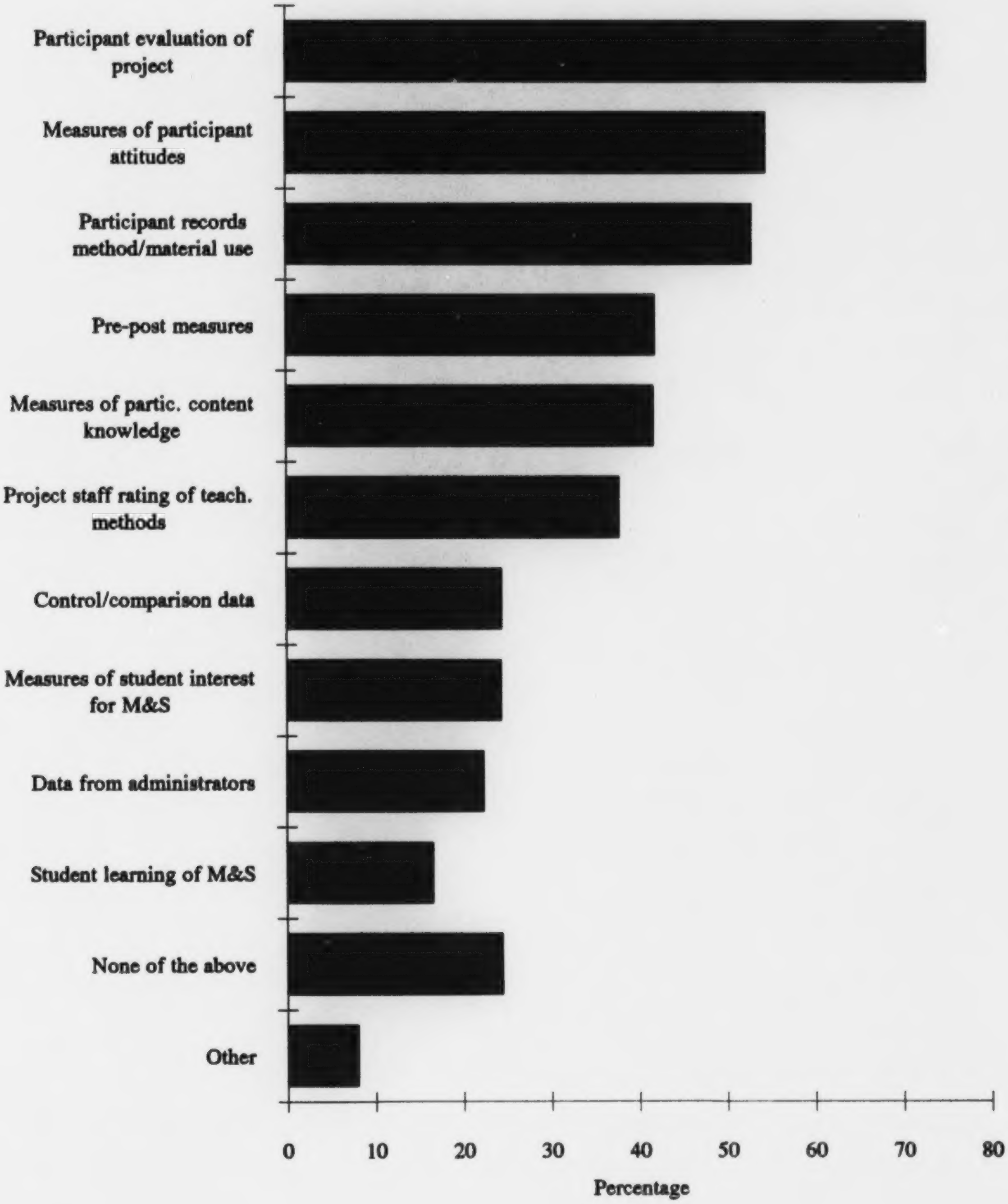
As seen in Figures 8.2 and 8.3, project staff and outside evaluators were often used to perform similar types of project evaluation. The most common forms of evaluation performed by either project staff or outside evaluators were participant evaluations of the project, participant records of the materials and teaching methods used, and measures of participant attitudes.

8.2 Assessments of Effectiveness of Teaching Methods and Materials

In each case where PIs indicated that a specific instructional method had been used in their TEP project, they were asked to indicate their assessment of its effectiveness (ranging from ineffective to very effective).

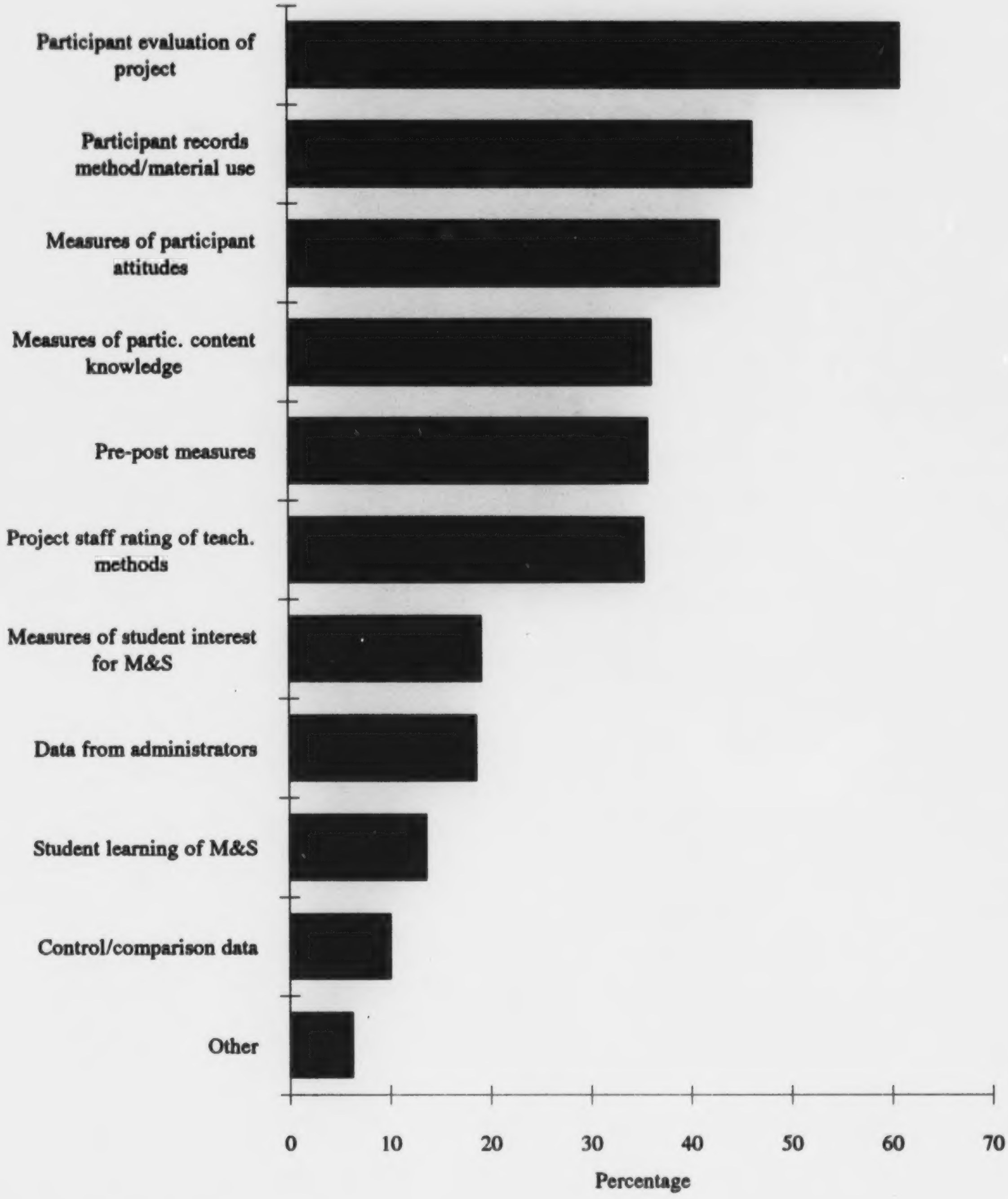
The methods most frequently rated as being very effective, as seen in Figure 8.4A, were teacher participation in hands-on activities (86.8%), field trips (63.0%), cooperative learning groups (56.7%), the development of student instructional materials (52.4%), and small group discussion (51.6%). Other methods less frequently cited as being very effective were the use of resource people, instructor demonstrations, and peer teaching. The use of films and videos, library research, and computer-assisted instruction were least often cited as being very effective methods.

Figure 8.1 - Reported TEP Project Evaluations, by Either a Project or Outside Evaluator, by Foci or Method of Evaluation



Source: PI Survey - Item 23

Figure 8.2 - Reported TEP Project Evaluations, by PI or Staff, by Foci or Method of Evaluation



Source: PI Survey - Item 23

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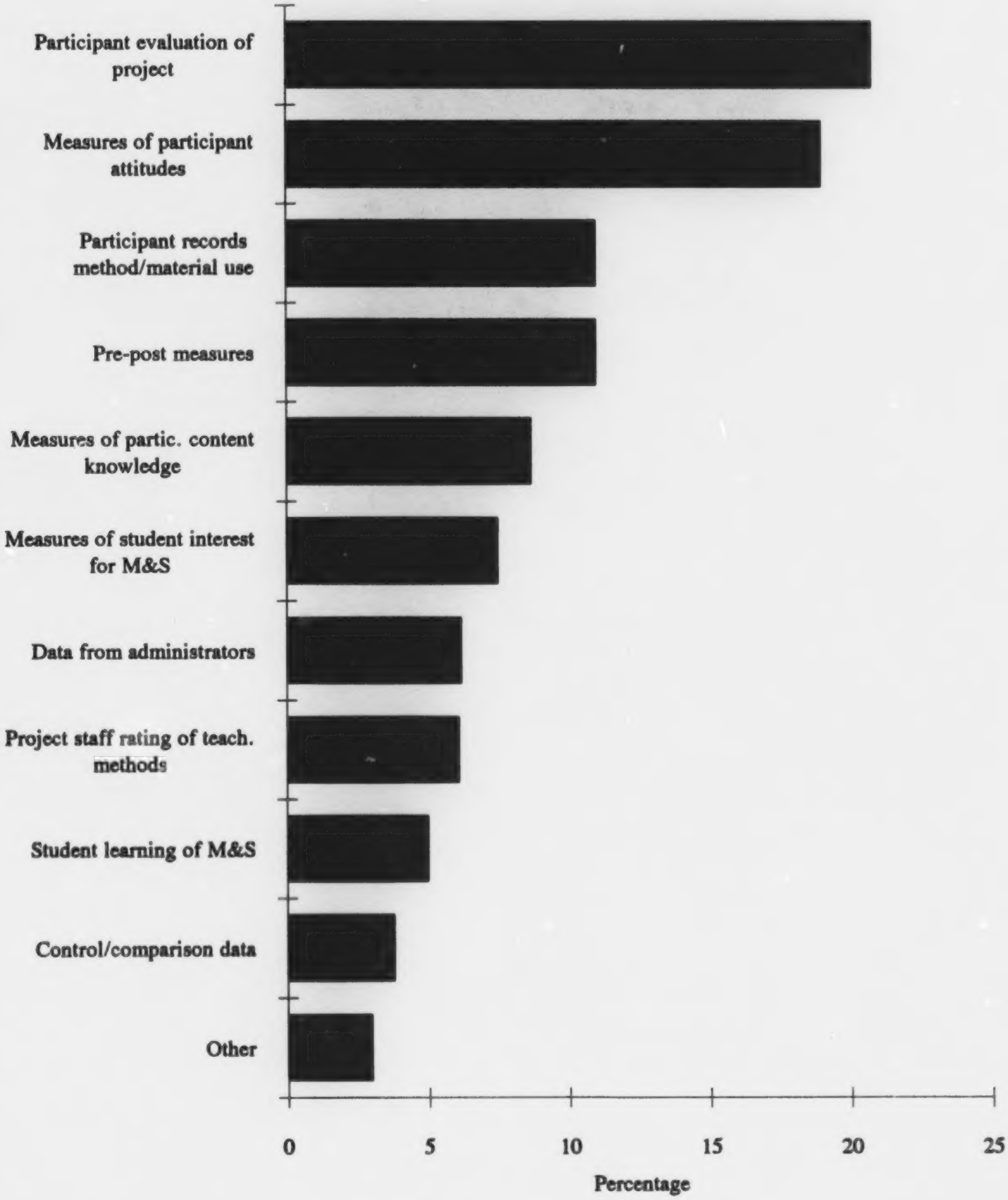
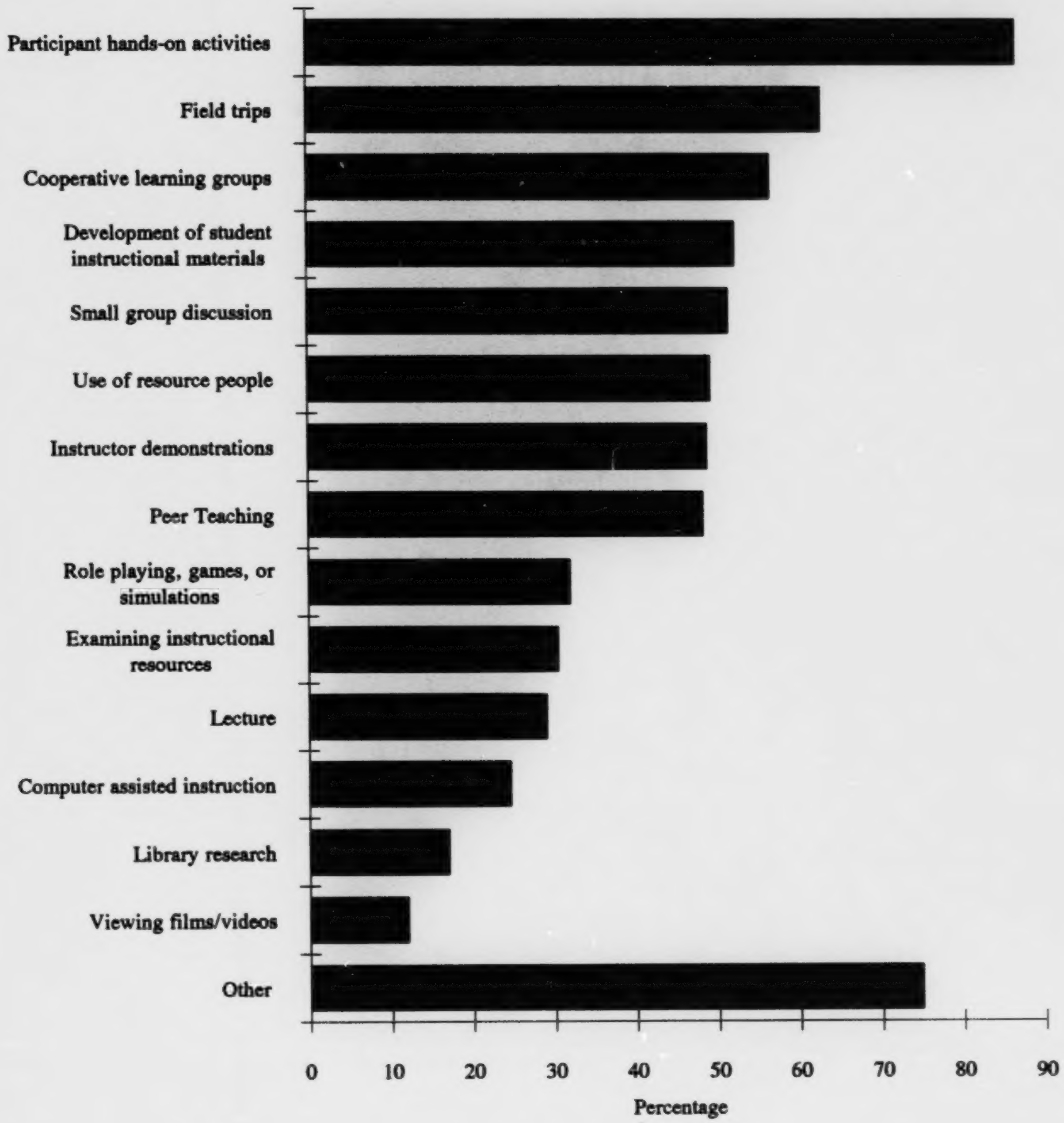
Figure 8.3 - Reported TEP Project Evaluations, by an Outside Evaluator, by Foci or Method of Evaluation



Source: PI Survey - Item 23

Figure 8.4A - PI assessments of the Usefulness of Various Teaching Methods and Materials (Percent Reporting as "Very Effective")



Source: Item 17

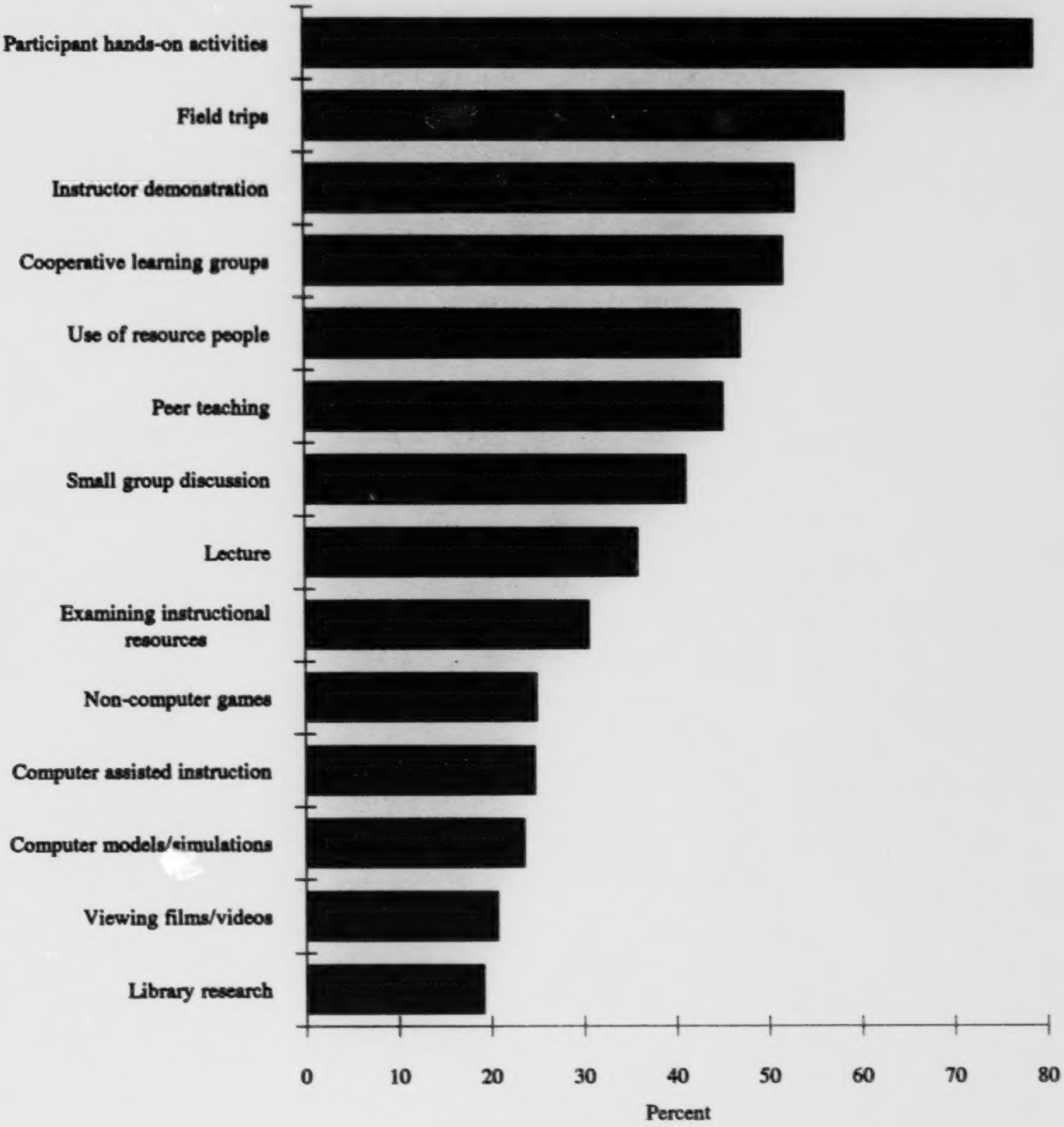
By way of comparison, participants' assessments of the usefulness of various teaching methods and materials, as shown in Figure 8.4B, closely matched the views of the PIs. According to participants, the most effective project methods include participant hands-on activities (78.9%), field trips (58.5%), instructor demonstrations (53.1%), and cooperative learning groups (51.8%). Methods less frequently cited by participants include the use of resource people (47.2%), peer teaching (45.3%), small group discussion (41.2%), and lectures (36.0%). The use of computers (including computer assisted instruction and computer models and simulations), viewing films and videos, and conducting library research were least often cited by participants as very effective teaching methods.

8.3 Assessments of Project Outcomes

Given the rather broad range of goals and objectives reported by TEP PIs, the study sought to answer the question of what types of project impacts and outcomes were actually achieved -- at least as perceived by the PIs themselves. PIs were asked to indicate, for each of a variety of possible outcomes, whether or not something was achieved, and if so, whether the impacts or outcomes were limited or fairly extensive. As shown in Figure 8.5A, those outcomes most likely to be reported included participants increasing their knowledge of science and mathematics content (81.1%), using new materials or lessons in their classrooms (72.6%), increasing their knowledge of the applications of science or mathematics principles (63.1%), and increasing their knowledge of other sources of information (58.3%). More than half of the PIs reported that promises of cost-sharing were honored (54.5%). The results reported by PIs did not noticeably change over time.

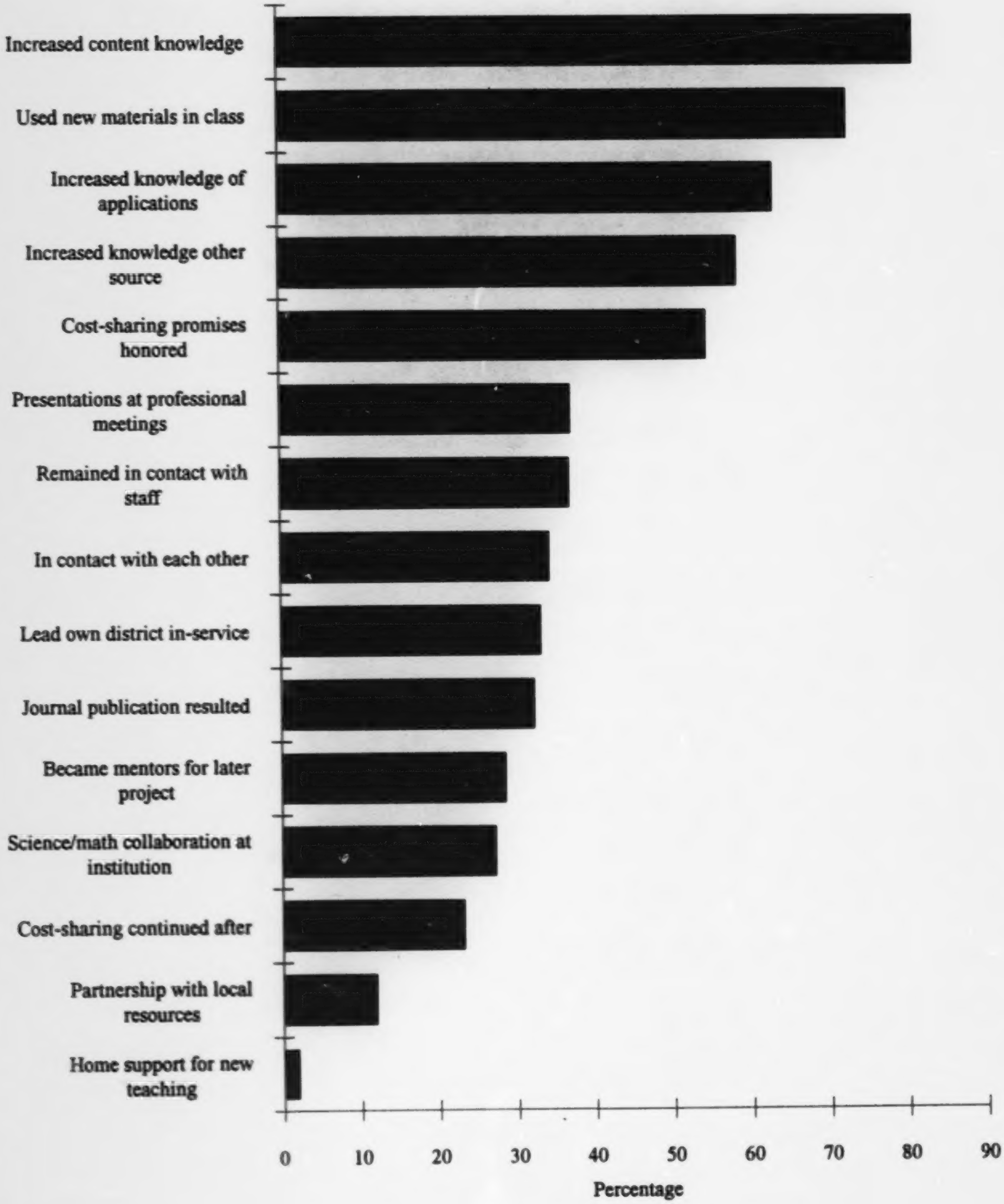
In comparison, as shown in Figure 8.5B, participants were asked to assess the outcomes of their TEP projects by rating statements about the project. The great majority of TEP participants (81.1%) agreed that they would strongly recommend TEP to another teacher. Participants also reported that they learned about materials they used in the classroom (61.4%), learned a lot from working with other teachers (61.4%), improved their knowledge of math and science content (60.4%), and increased their knowledge of the application of math and science principles (58.2%). The outcomes cited least often by participants were serving as a TEP staff member or mentor (10.8%), establishing a partnership with local resources (11.6%), and learning ways to motivate female, minority, and disabled students (16.3%).

Figure 8.4B - Participant Assessments of the Usefulness of Various Teaching Methods and Materials (Percent Rating as "Very Effective")



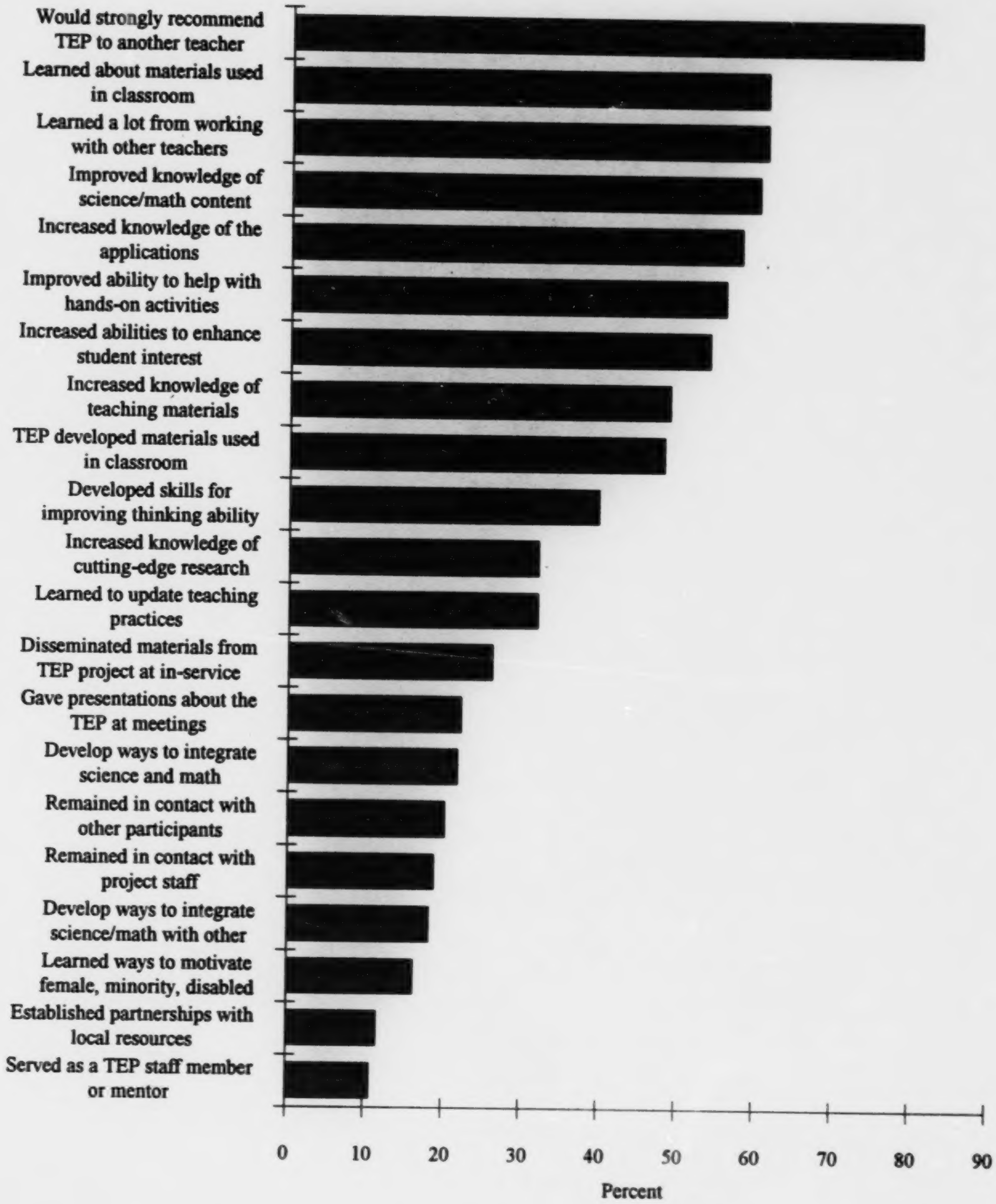
Source: Participant Survey - Item 6

Figure 8.5A Principal Investigators Assessments of Project Outcomes



Source: PI Survey - Item 22

Figure 8.5B - Participant Assessments of Project Outcomes



Source: Participant Survey - Item 8

Continued participant contact with other participants and with TEP project staff is related to cohort year, participants from recent cohorts are more likely to report having remained in contact with colleagues met through their TEP projects than participants from earlier years.

8.4 Teaching Situation and Activities Before and After TEP participation

Before looking at the effects of TEP participation on teaching activities, it is important to examine the present context of teaching. Three questions are addressed here: whether the teachers are working in the same school district; whether they are working at the same grade levels, and whether they are doing the same or similar activities as prior to TEP.

8.4.1 Current School Districts if Differing from Pre-TEP Districts

TEP Participants were asked to indicate whether they were still teaching in the same school district as before their TEP participation. A total of 15.0 percent reported that they were not. Differences are summarized in Figures 8.6 through 8.9.

Location of School Districts

As shown in Figure 8.6, among teachers that changed school districts after participating in TEP, there was a general shift out of rural school districts and into suburban and urban districts. While 31.7 percent of participants reported teaching at a rural school at their time of their TEP enrollment, among those teachers that changed school districts after participating in TEP, only 22.0 percent reported teaching in a rural school district. Among participants that are teaching in new school districts, 38.7 percent reported teaching in urban districts and 39.3 percent reported teaching in suburban districts, compared to 34.5 percent and 33.8 percent respectively at the time of TEP enrollment.

Type of School

As shown in Figure 8.7, teachers that have changed school districts since enrolling in the TEP program are no more likely to teach in private schools than before TEP enrollment. Before enrolling in the TEP program, 7.8 percent of participants reported teaching at private schools, among those teachers that changed districts following their TEP projects, 5.6 percent are teaching in private schools.

Figure 8.6 - The Location of Participants' School Districts

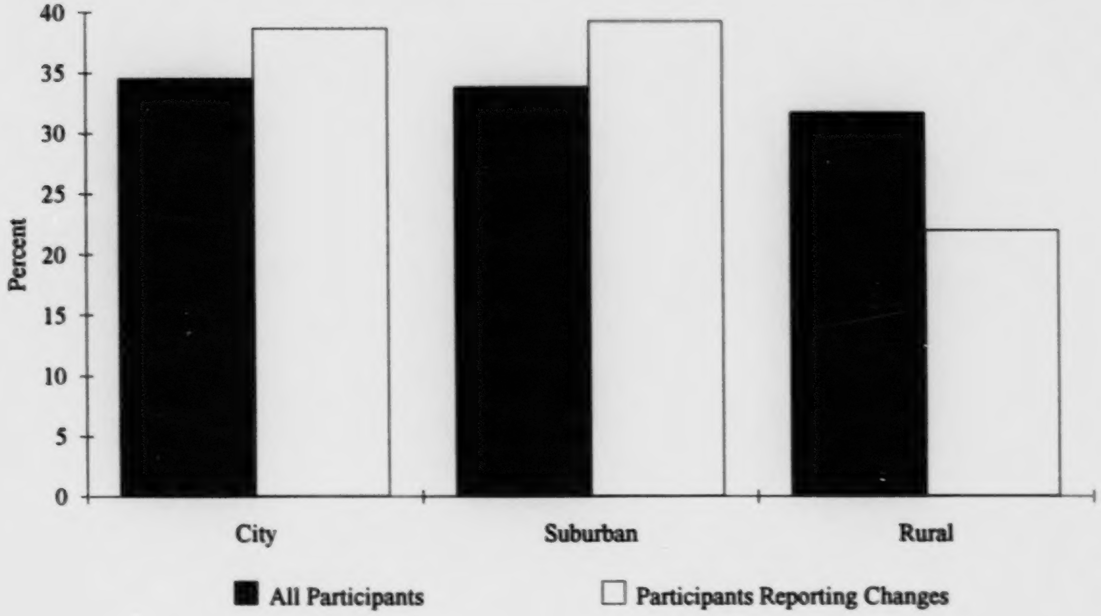
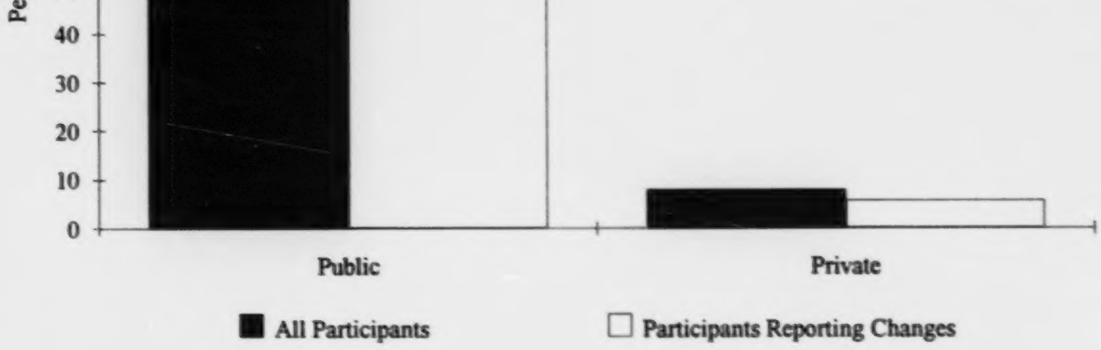


Figure 8.7 - The Type of Participants' School Districts



Percentage of Students Eligible for School Lunches

TEP participants that have changed school districts since participating in the program are likely to be teaching in school systems with a similar percentage of students that are eligible for school lunches. Among participants that have changed school systems, 10.6 percent reported that they are teaching in school systems where between 76 and 100 percent of students are eligible for school lunches, compared to 10.1 percent of all participants at the time of TEP enrollment.

Racial and Ethnic Composition of Student Body

As shown in Figure 8.9, participants that reported changing school systems since participating in the TEP program are now more likely to be teaching in a school district with a larger minority population than were all participants before enrollment. Participants that have changed school systems reported that 21.0 percent of the student body of their new school district is Black, 8.0 percent in Hispanic, 3.8 percent in Asian or Pacific Islander, and 1.4 percent in American Indian/Alaskan Native; compared to 16.6 percent Black, 8.3 percent Hispanic, 2.8 percent Asian or Pacific Islander, and 1.2 percent American Indian/Alaskan Native as reported by participants before TEP enrollment.

8.4.2 Present Teaching Responsibilities

Figure 8.10 shows the distribution of participants' teaching activities following the TEP project. As can be seen, the most often cited subject matter areas were mathematics (19.4%), self-contained classes (12.8%), chemistry (13.0%), biology (11.9%), and general/physical science (7.9%). The subject areas least often cited include geography (.4%), health science (1.0%), and environmental science (1.6%).

As compared to the data presented in Figure 5.17, which indicated the teaching activities, prior to TEP participation, the distribution of teaching activities by subject area did not change for most TEP participants following their involvement in the program.

Figure 8.8 - Percentage of Students Eligible for School Lunches in Participants' School Districts

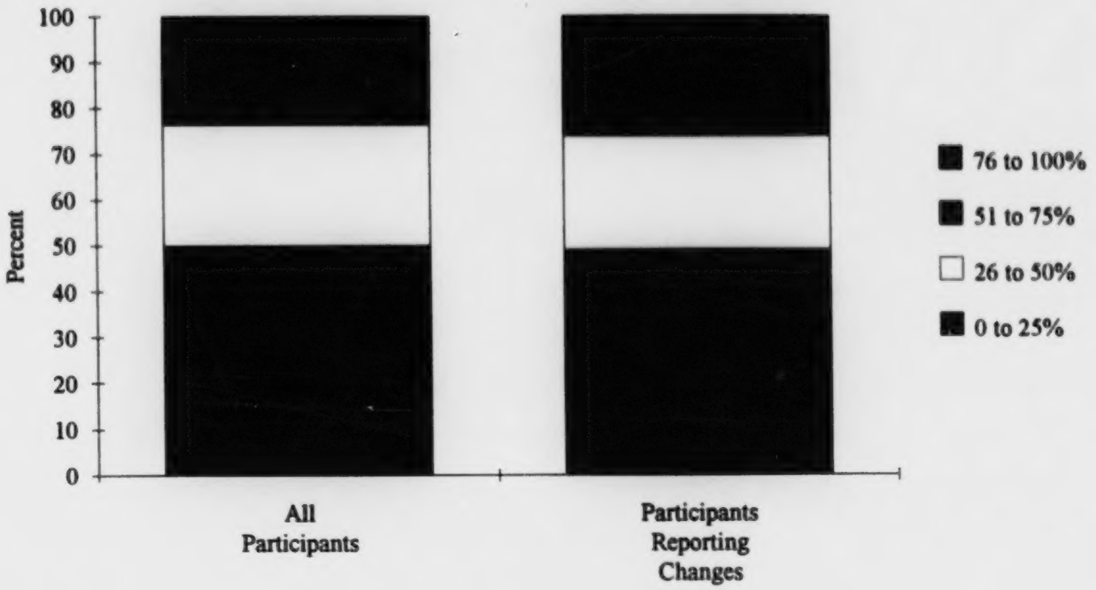


Figure 8.9 - Racial and Ethnic Composition of Participants' School Districts

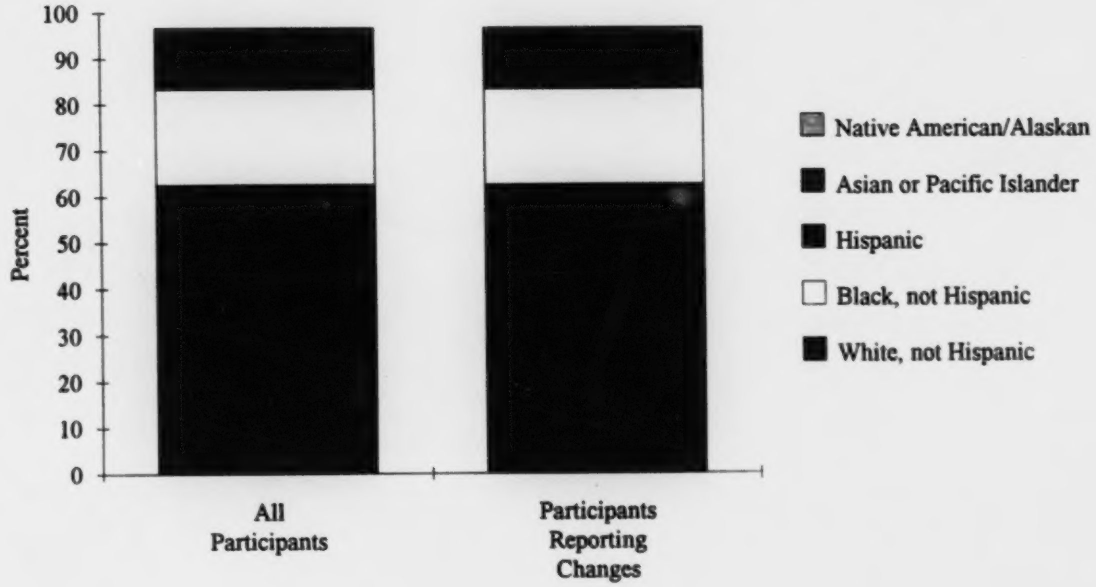
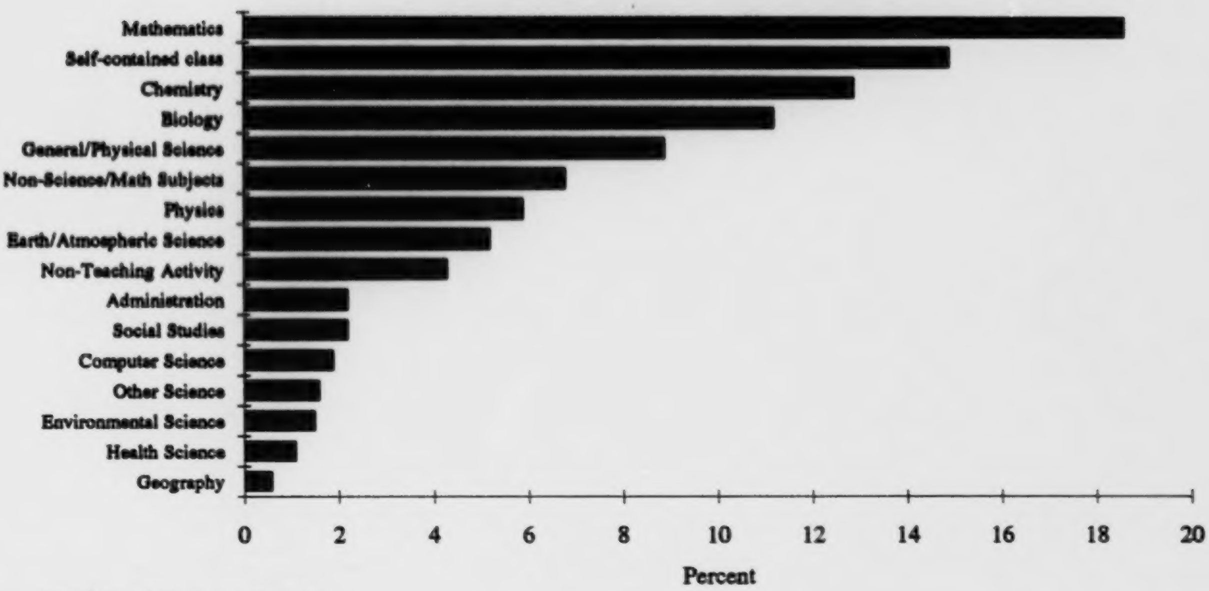
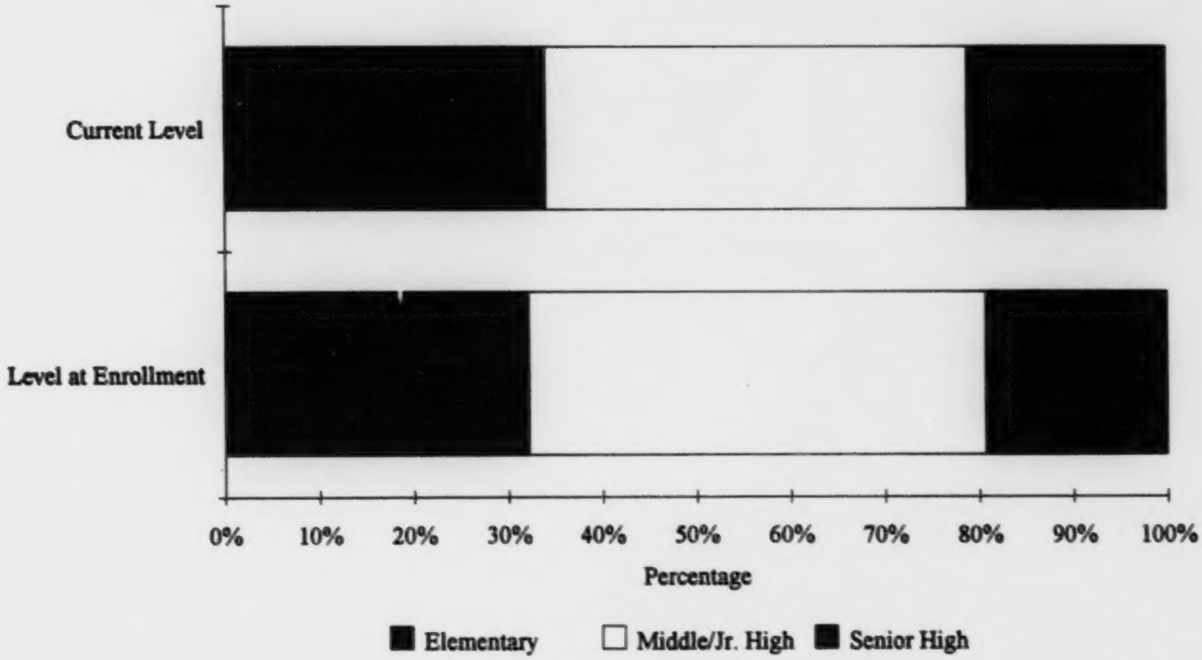


Figure 8.10 - Distribution of Teaching Activities by Substantive and Other Areas



Source: Participant Survey - Item 24

Figure 8.11 - Current Teaching Level



8.4.3 Present Grade Level Taught

TEP participants also reported on the present grade level that they taught. As shown in Figure 8.11, the greatest percentage of participants are teaching at the middle grade level (44.8%). Participants teaching at the elementary and high school levels comprised 34.0 percent and 21.1 percent respectively. These data may be contrasted with grades taught prior to TEP participation, as indicated in Figure 8.11, few participants have changed teaching levels since participating in the TEP program.

8.5 Establishing Partnerships with Others in the Scientific Community

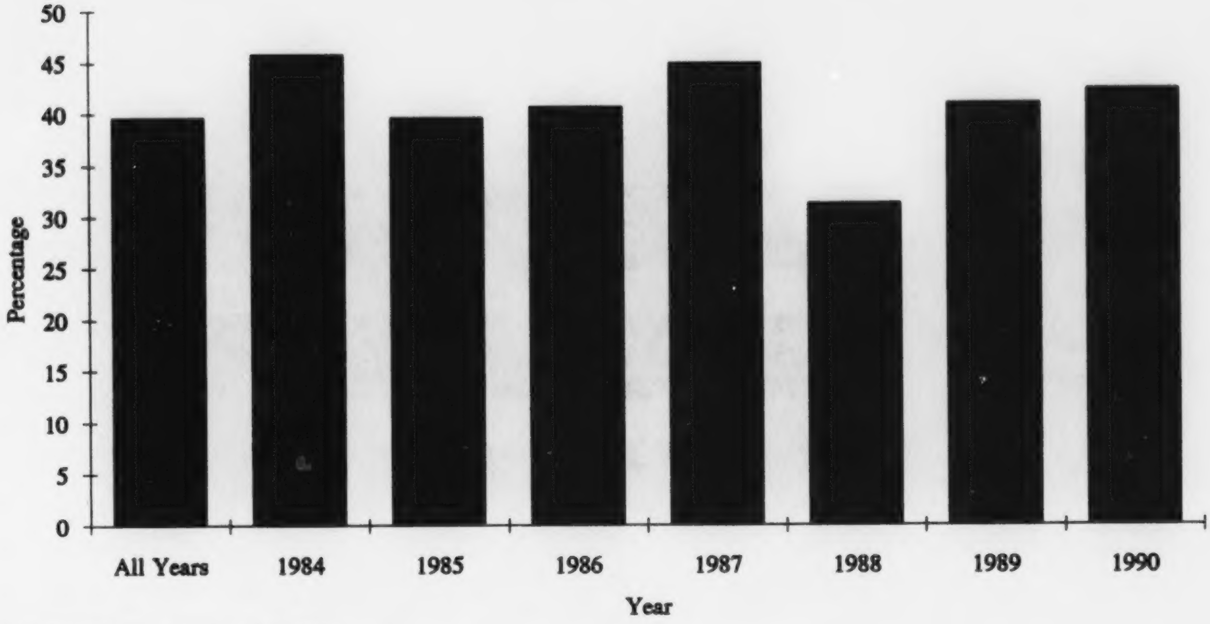
Participants were asked to indicate whether or not they had established working partnerships with other institutions. As shown in Figure 8.12, across all years 39.6 percent of participants reported that they had formed a working partnership with a scientific institutional resource. Over time, the percentage of participants having developed such a partnership ranged from 31.3 percent in 1988 to 45.8 percent in 1984 with no clear trend emerging over time.

Among those reporting such partnerships, as seen in Figure 8.13, the most frequently identified types of institutions were university science faculty (25.4%), university education faculty (17.0%), university faculty in mathematics or computer science (10.9%), and persons from private industry 10.6%).

8.6 Usefulness of the Project in terms of Applications to Teaching

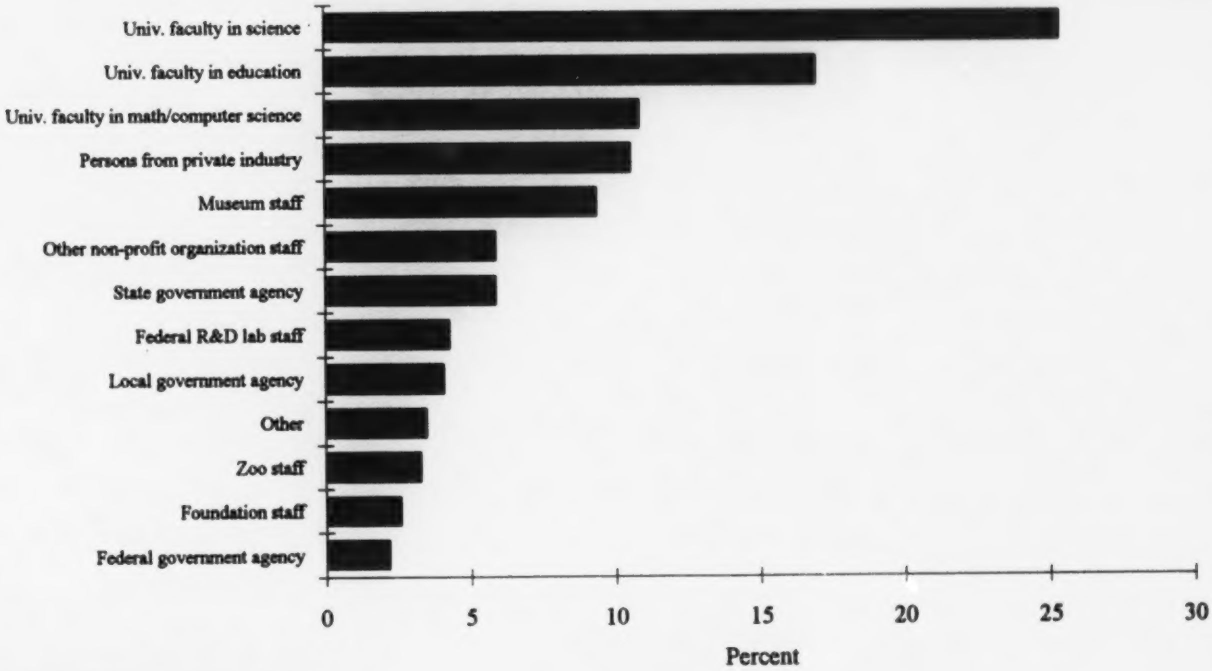
Participants were asked to rate their TEP projects in terms of a broad range of criteria. As shown in Figure 8.14, the elements of the TEP project with the highest ratings for excellence include the knowledge of TEP staff members on content and subject matter (76.4%), the responsiveness of staff to participants (69.9%), and the overall quality of the program (68.5%). Components of the TEP program that received the lowest ratings include the knowledge of TEP staff members about schools and teaching (42.6%), and the quality of printed materials used (45.2%).

Figure 8.12 - Reported Establishment of Working Partnerships with Other Scientific Institutional Resources



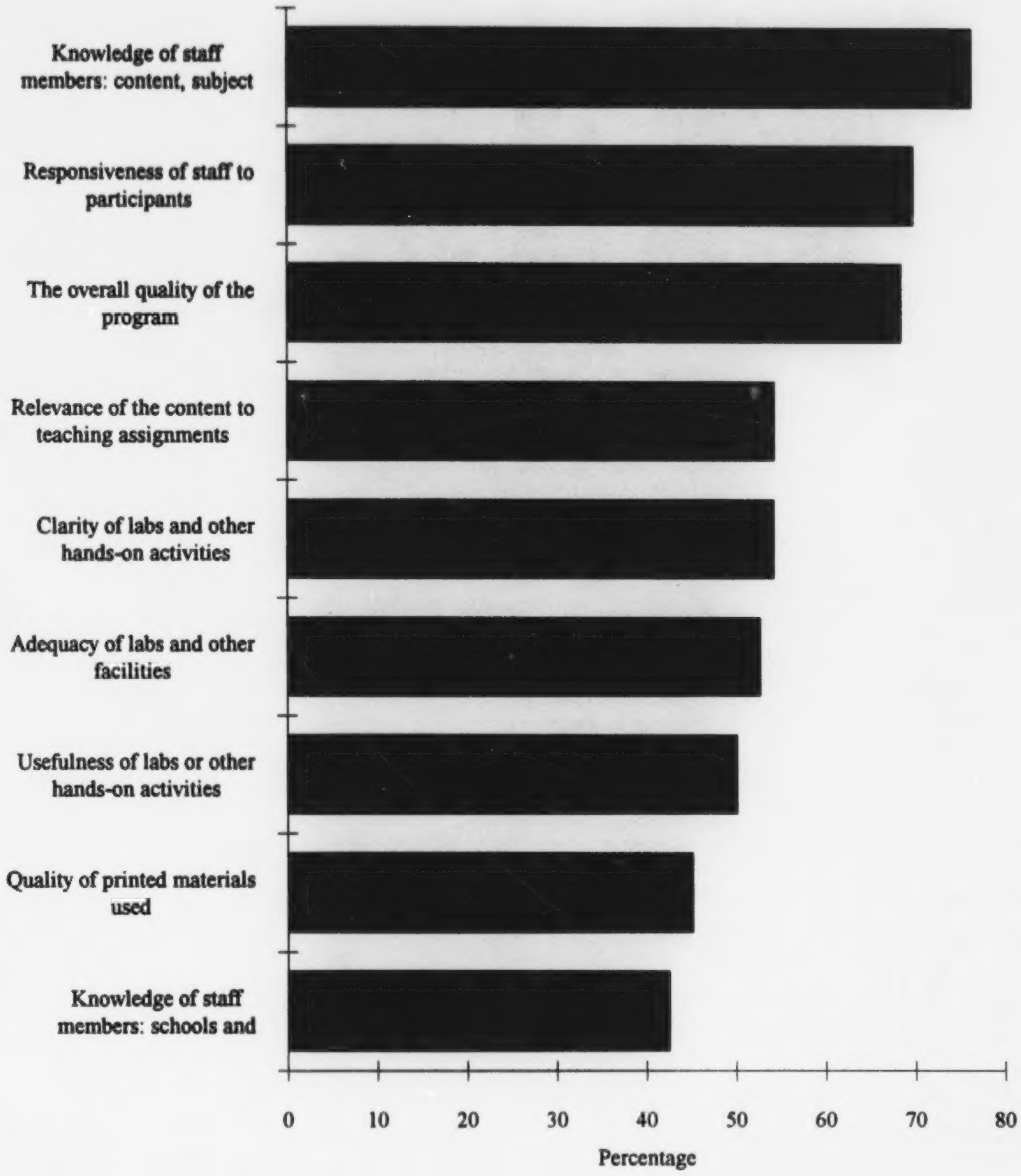
Source: Participant Survey - Item 9A

Figure 8.13 - Types of Institutions with Which Relationships were Reported



Source: Participant Survey - Item 9B

Figure 8.14 - Post-Project Usefulness of Methods and Materials to Participants



8.7 Changes Reported in Teaching Content and Method

A critical concern is the extent to which changes occurred in teaching methods and contents among TEP participants. In addition, a major concern is with changes which, in the opinion of the participants themselves, occurred primarily or somewhat in association with TEP project participation (as distinct from other contributing factors). As can be seen in Figure 8.15A, participants reported that since TEP they have provided students with more hands on lab experiences (80.0%), had them work more in small groups (74.7%), integrated the applications of mathematics and science into their teaching more (70.7%), and helped students more to find answers to their own questions (66.8%). In contrast, participants reported that they have decreased the amount of time spent lecturing to a whole class (34.7%), and decreased the time that students spent reading textbooks in class (34.9 percent).

A important related question is the extent to which TEP participants saw their changes in teaching behaviors as related to the TEP experience. As shown in Figure 8.15B, the biggest impacts that TEP had on participant teaching activities was in giving participants the skills to provide students with hands-on lab experiences (45.4%), to conduct scientific demonstrations for their students (32.7%), and to use computers in the classroom (30.9%).

8.8 Student Learning Activities in Science and Mathematics Before and After TEP Participation

It may be assumed that where teachers change their teaching behaviors, some effects may be noticed upon students. However, this is a difficult question to assess inasmuch as the students being taught today are not the same as those taught several years ago, and different (external) factors may account for changes in students that do occur. However, since it is unlikely that there will be a study of students for some time, the next best option is to explore two considerations with the TEP participants. First, have certain changes occurred? Second, to what extent do the TEP participants themselves believe that their TEP participation (and subsequent changes) have contributed to the changes they report? As shown in Figure 8.16A, since TEP, participants have noticed increased enthusiasm in class (80.0%), an increase in classroom test scores (52.0%), and increased interest among students in careers in mathematics and science (49.2%).

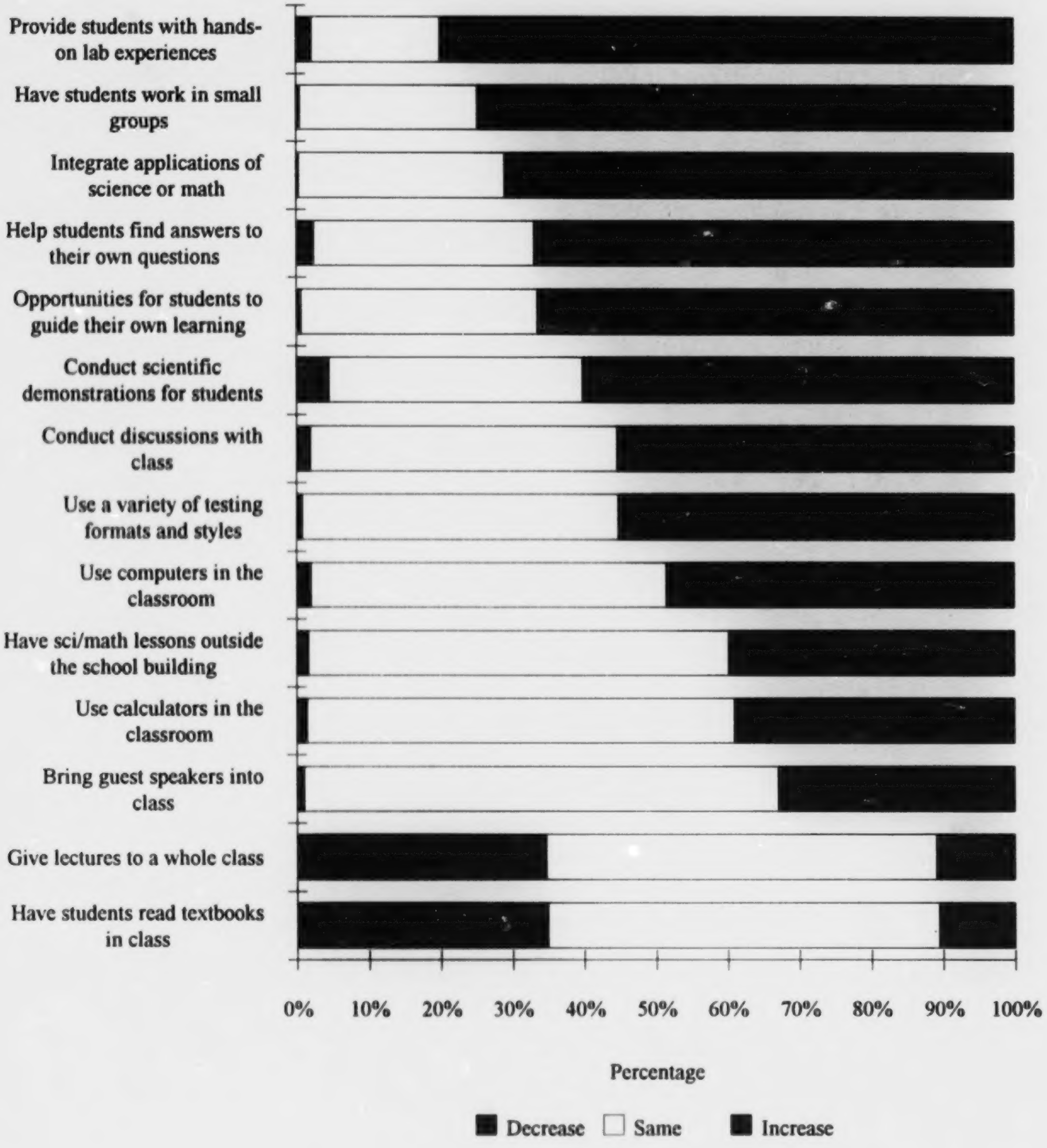
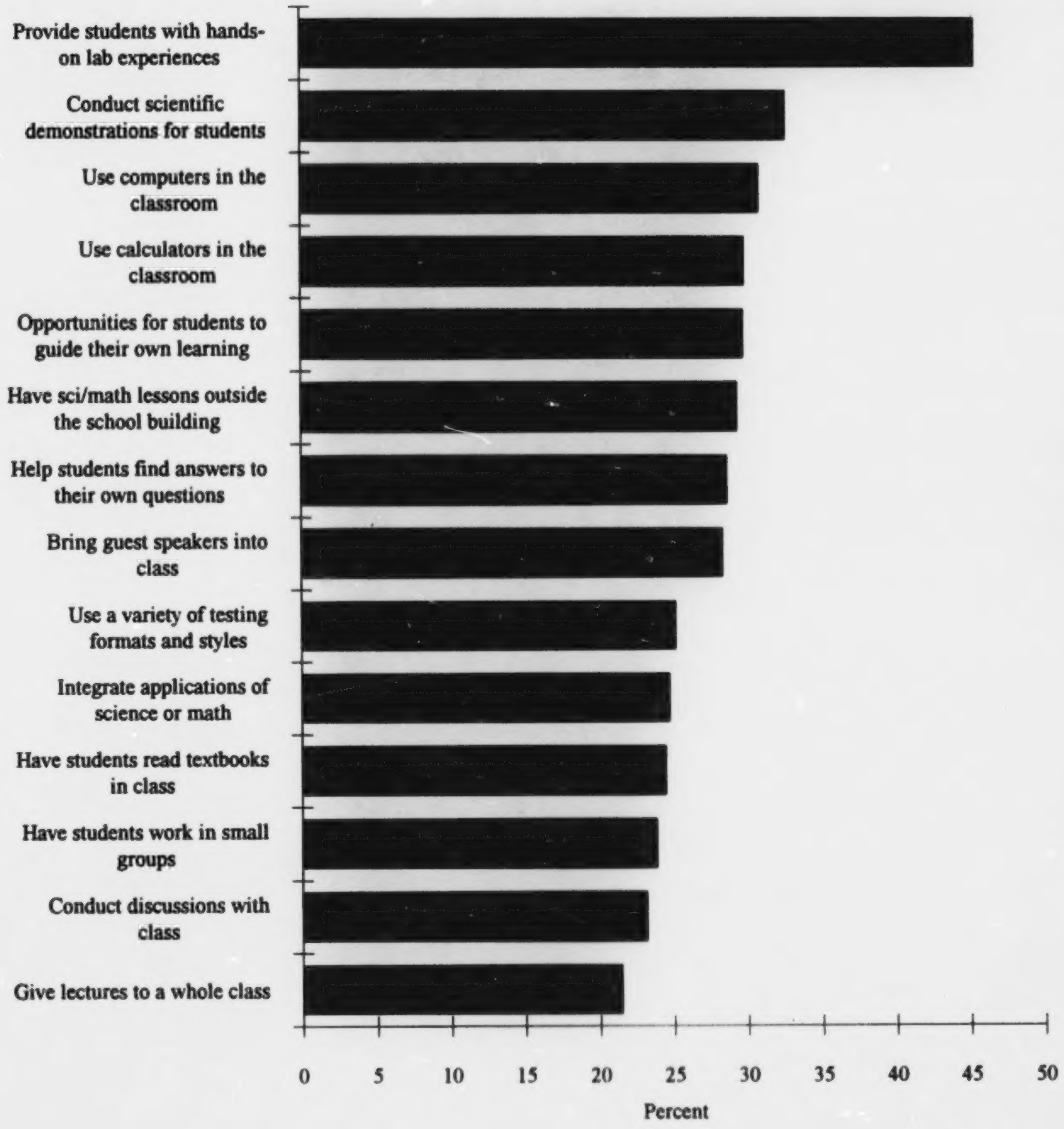


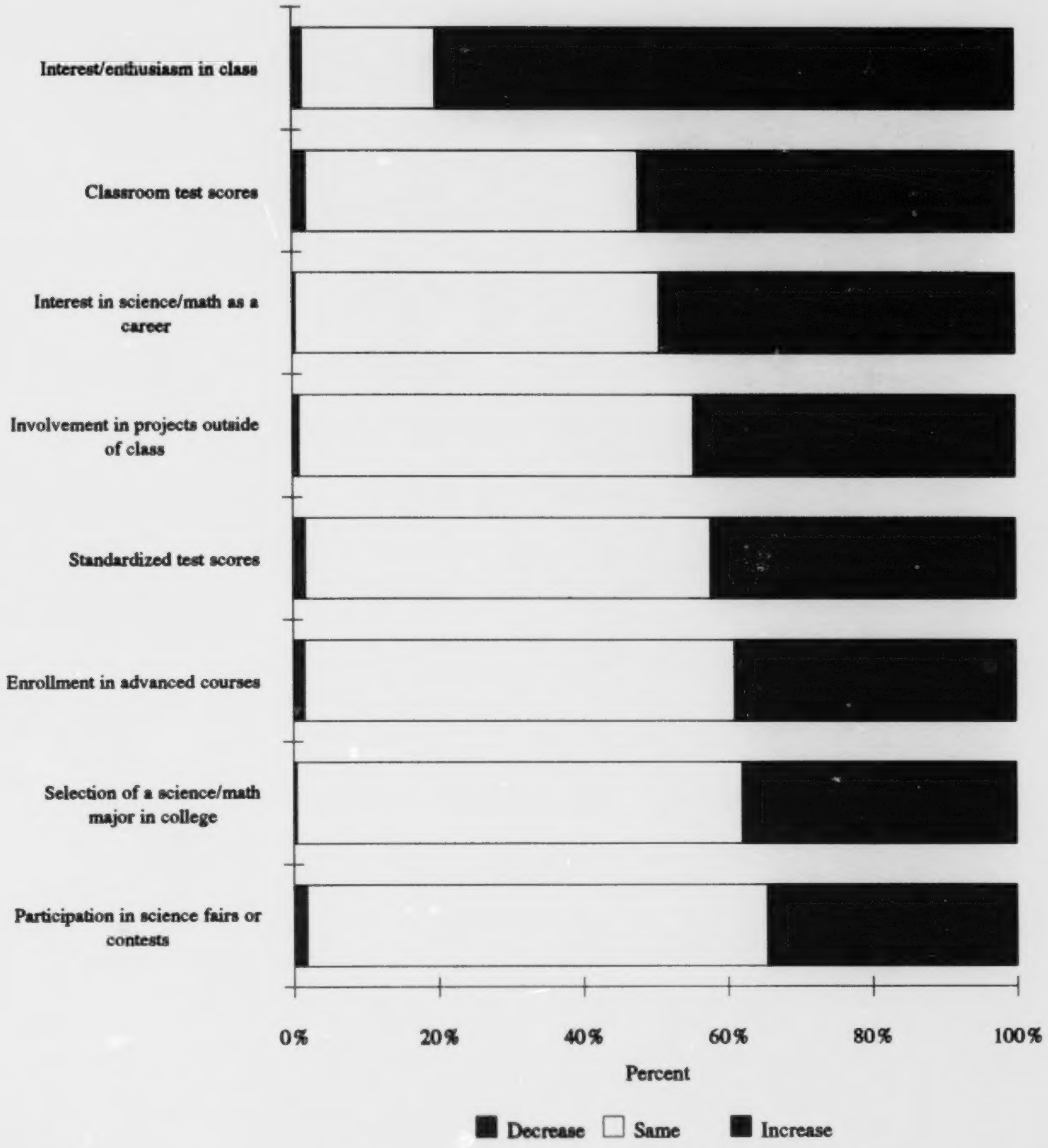
Figure 8.15A - Participant Reports of Changes in Their Teaching Activities

Figure 8.15B - Extent to Which Changes in Teaching Activities are Attributed to TEP by Participants



Source: Participant Survey - Item 10A

Figure 8.16A - Changes in Student Characteristics Since TEP Experience



Source: Participant Survey - Item 10B

As shown in Figure 8.16B, roughly two thirds of participants believed that their TEP experience had a major or fairly major impact, in turn, upon some of the changes in student behavior that they observed. These changes included increased student interest and enthusiasm in class, greater involvement in projects outside of class, improvement in standardized test scores, and increased participation in science fairs. A majority believed that the remaining changes in student behaviors related to TEP participation as well.

8.9 Post-Project Professional Activities by Participants, their Institutions, and others

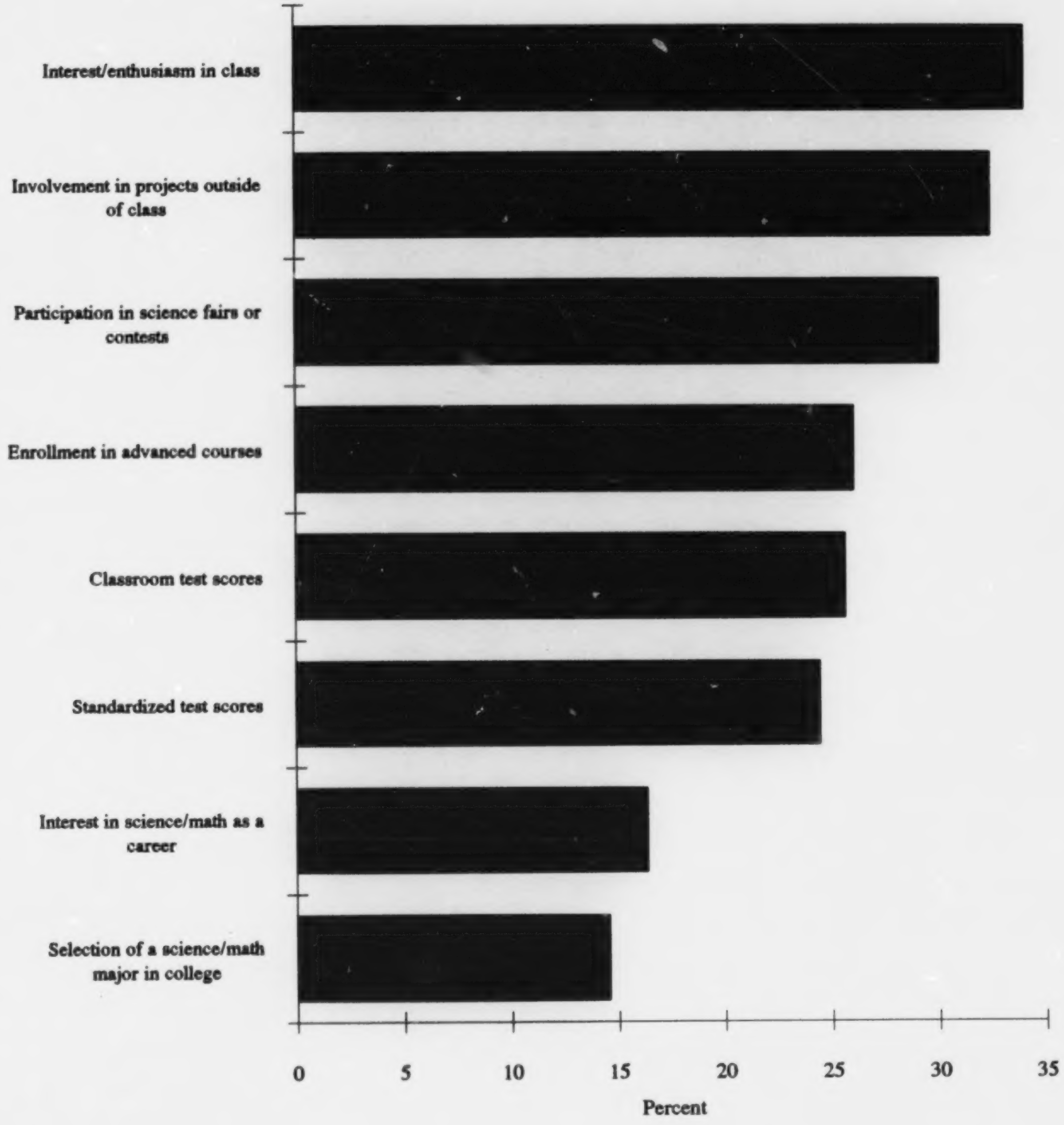
Those PIs whose projects terminated prior to June, 1989 (and who thus would have had sufficient time to see post-project results), were asked to report on the ways in which their project methods and materials were used a year after their project had ended. Of those responding, as shown in Figure 8.17A, the largest percentages reported that participants were using the project material in their own classes (86.4%), and that they were sharing the materials with other teachers (80.6%). Many PIs also reported that their institutions (43.1%) and school districts (32.2) were using the materials for workshops and in-service teacher education programs funded by sources other than NSF.

Participants were also asked to report on their post-project professional activities. As shown in Figure 8.17B, the most common post-TEP follow-up activities cited by participants include serving as a mentor to other teachers with their school district (60.2%), making presentations to other teachers outside of their school (43.7%), and contacting someone at a college or university (33.7%). The post-project activities cited least often by participants included using a computer network to maintain contacts (11.7%), writing for professional publication (14.3%), and serving as a staff member at a summer program (17.1%).

8.10 Science Teaching in Participants' Districts

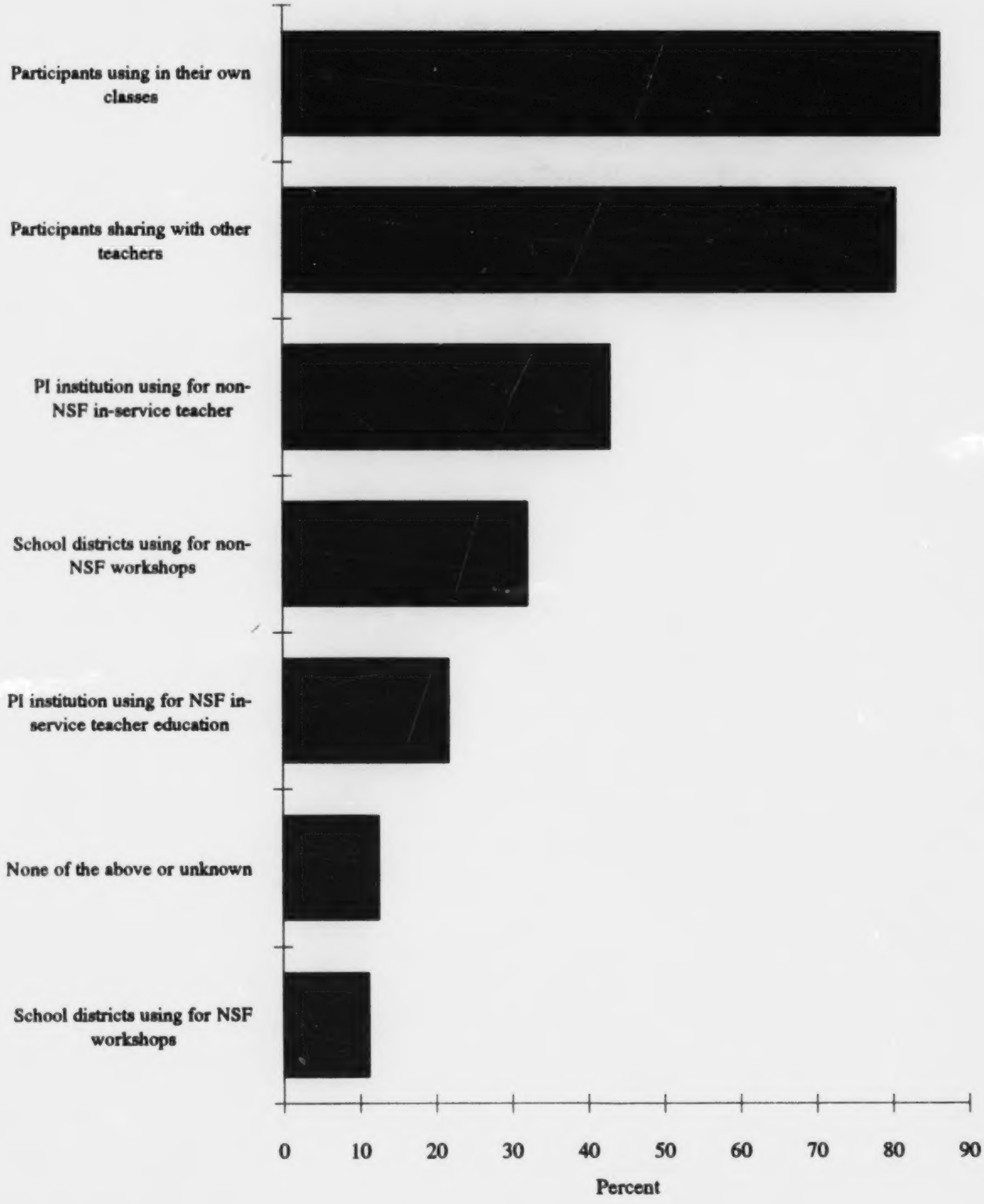
TEP participants reported on a variety of characteristics with regard to the school districts in which they teach. Specific attention focused on those characteristics most related to the teaching of science and mathematics. As shown in Figure 8.18, just over half of all participants felt that the principal of their school supports improved teaching methods for math and science (53.5%). Many participants also felt the they had a lot of flexibility to choose topics (49.5%), and that school administrators encouraged hands-on methods (41.8%). Participants

Figure 8.16B - Extent to Which Changes in Student Characteristics are Attributed by Participants, to TEP



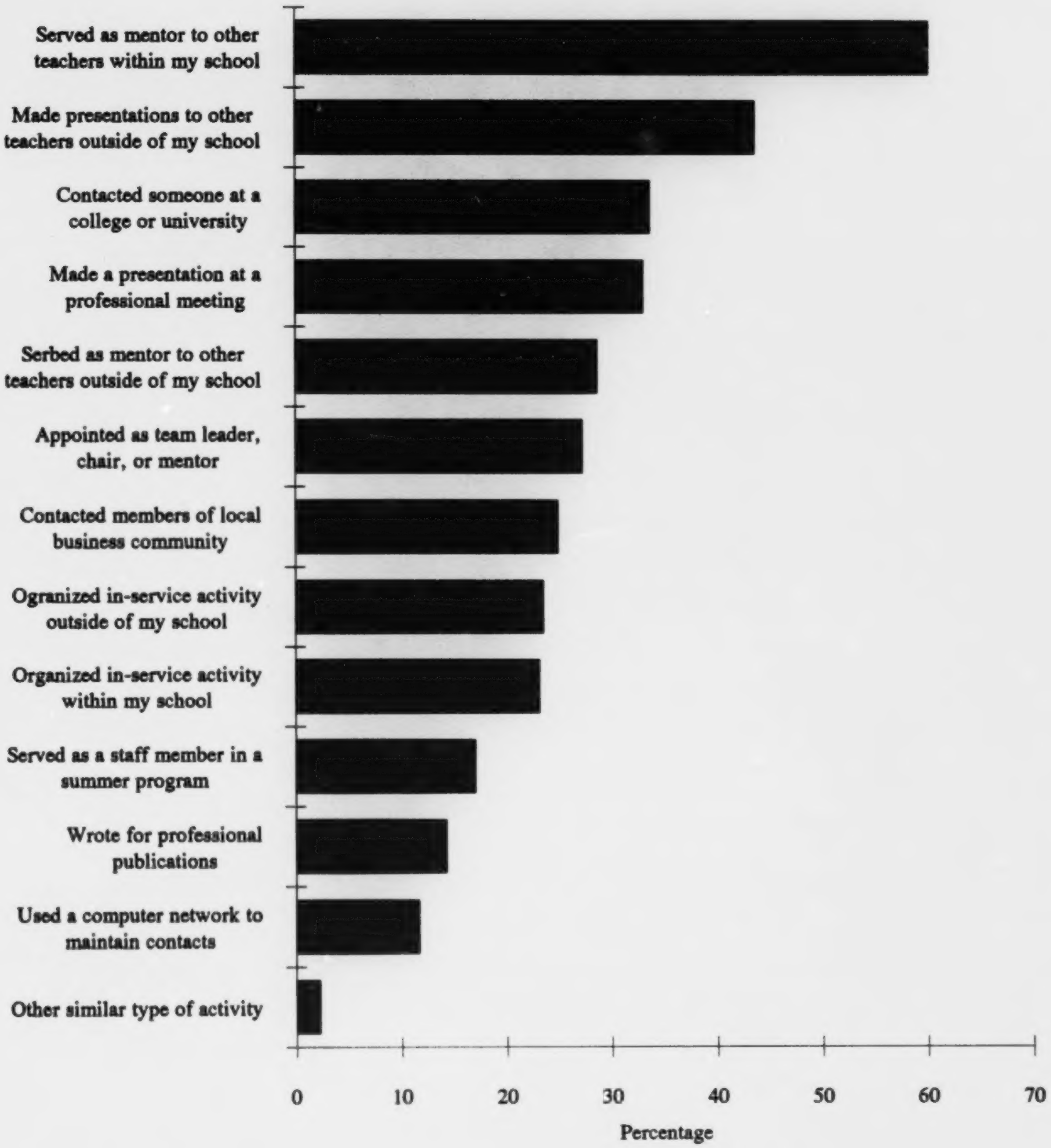
Source: Participant Survey - Item 10B

Figure 8.17A - PI Reports of Post-Project Activities



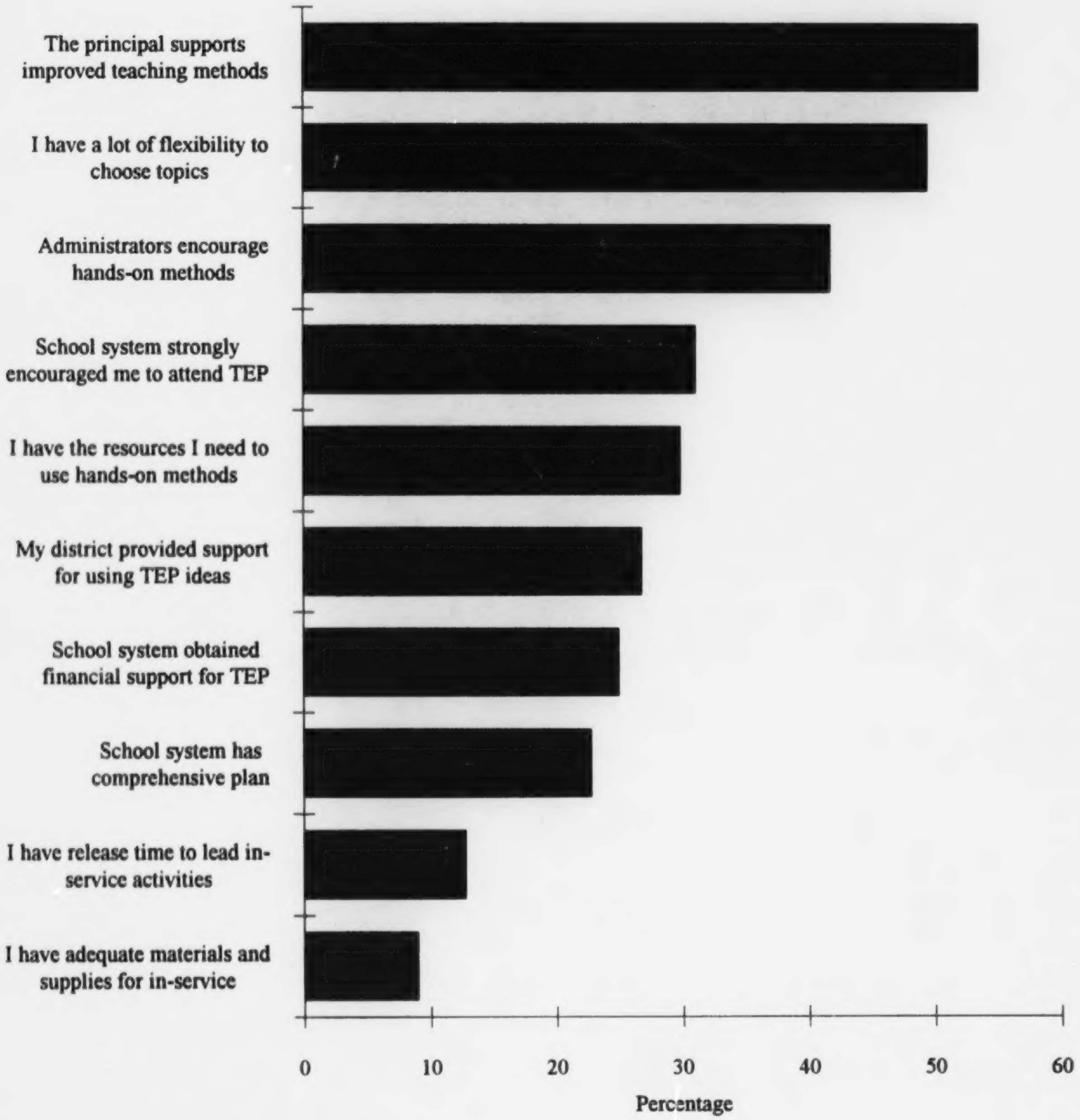
Source: PI Survey - Item 21

Figure 8.17B - Participant Reports of Post-Project Activities



Source: Participant Survey - Item 11

Figure 8.18 - Characteristics of Participant School Districts on Related Science and Mathematics Characteristics (Percent Reporting Statement "Very True")



Source: Participant survey - Item 12

were less likely to agree that they had adequate materials and supplies for in-service activities (9.0%), and that they had release time to lead in-service activities (12.8%).

8.11 Barriers in School Districts to Applying TEP Experience

Figure 8.19A provides information regarding the key barriers to the effective teaching of science and mathematics. According to participants, the principal barriers to improving the teaching of science and mathematics are a lack of supplies, materials and funds (61.1%), inadequate facilities and lack of appropriate space (14.7%), and a lack of administrative support (12.8%). Over time, the general trend indicates that a greater percentage of participants agree that a lack of supplies, materials, and funds are an obstacle to improved math and science teaching.

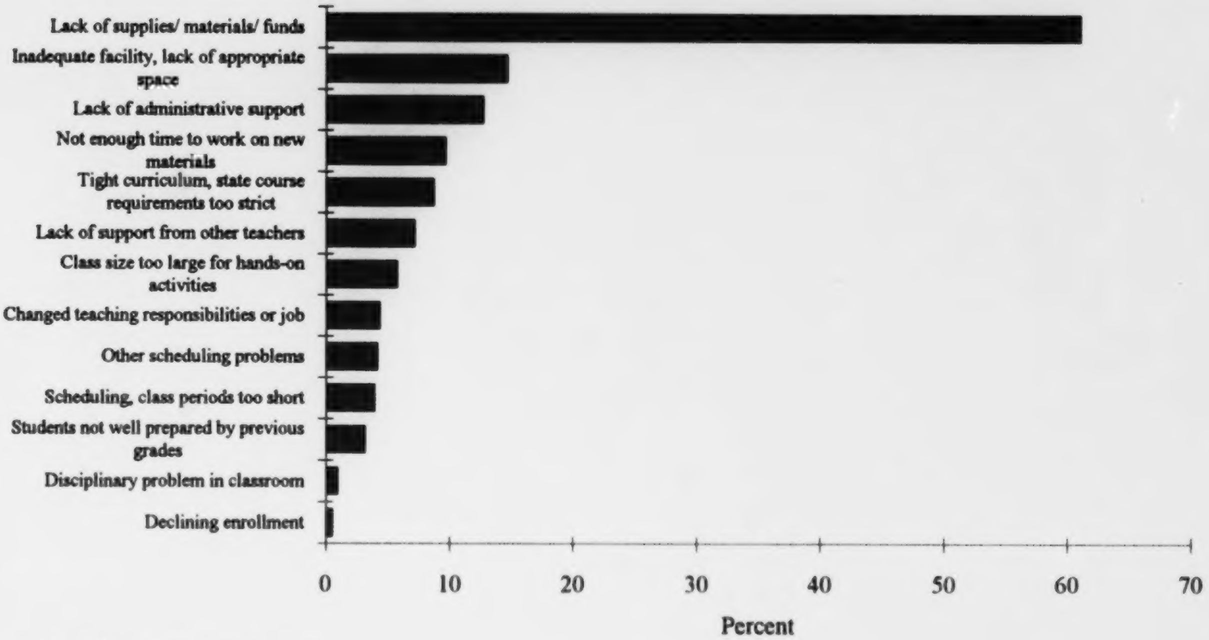
As shown in Figure 8.19B, over time, the general trend indicates that more participants are agreeing that there are barriers to applying new content and methods for improving math and science education. Across all years, 32.7 percent of participants responded that their are barriers to improving math and science education; the percentage of participants citing barriers to improved education increased from 18.9 percent in 1984 to 34.8 percent in 1990 with a high of 39.0 percent in 1986.

8.12 Perceived Value of TEP for Teachers with Administrative Responsibilities

Participants were asked to indicate whether administrators should participate or be involved in such activities as a Teacher Enhancement Project of the type they attended. As shown in Figure 20A, a majority of participants (56.9%) indicated that TEP participation would have value for school administrators. The general trend indicates that over time more participants are favoring TEP school administrator participation in the TEP program; the percentage of participants favoring administrator participation increased from 50.5 percent in 1984 to 59.8 percent in 1990 with a high of 60.7 percent in 1989.

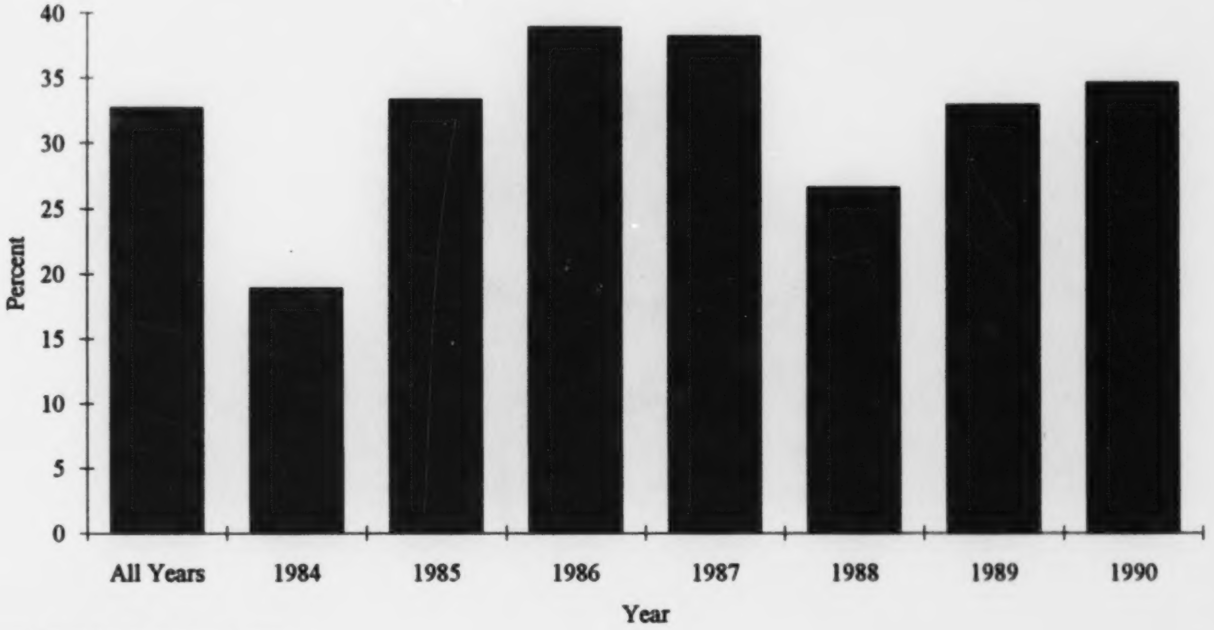
Among those that indicated that such participation would be useful, a variety of reasons were given. As shown in Figure 20B, the most common reason given by participants was that administrators need to learn more about science and science education (35.0%). Participants also reported that administrators should attend a project as a participant (26.9%), and that they need to realize the importance of science education (20.9%). Finally, 4.1 percent of participants reported that administrators attended and were involved in their TEP program.

Figure 8.19A - Barriers to Improving the Teaching of Science and/or Mathematics



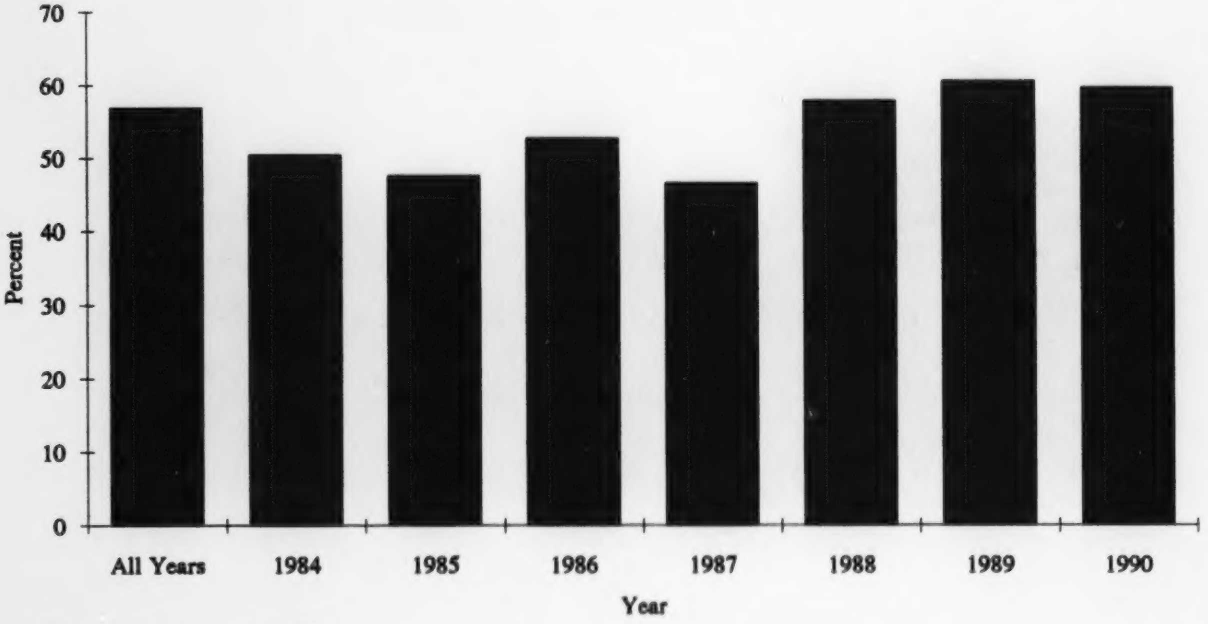
Source: Participant Survey - Item 28

Figure 8.19B - Barriers to Improving the Teaching of Science and/or Mathematics, by Award Cohort



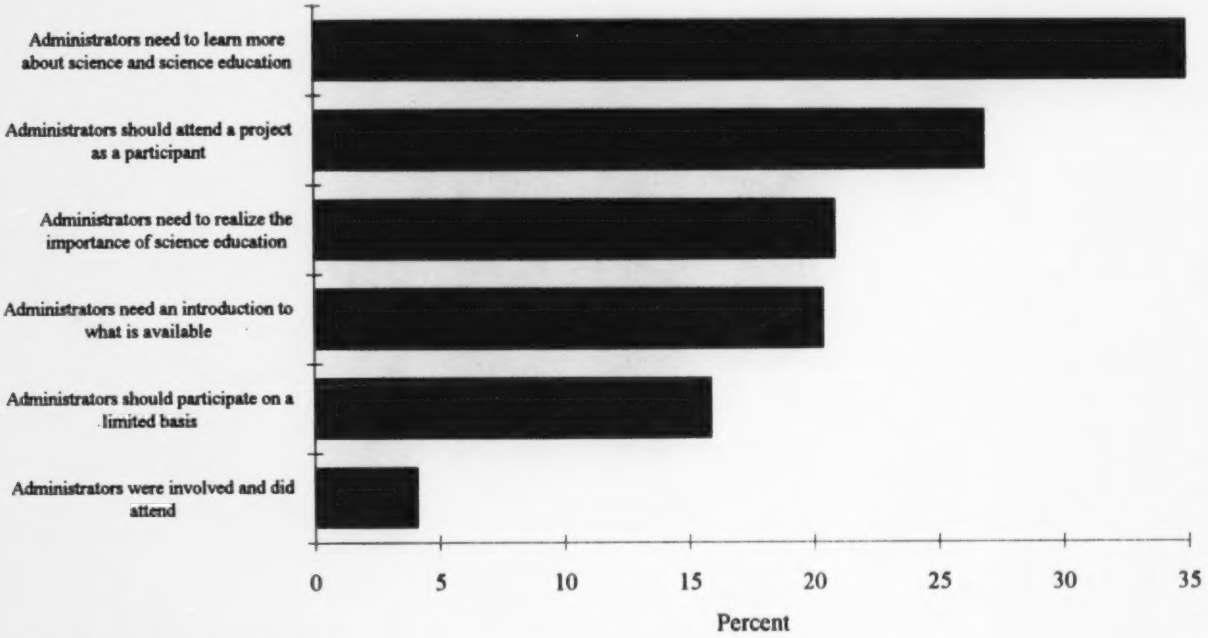
Source: Participant Survey - Item 28

Figure 8.20A - Percentage of Participants Perceiving Value of TEP Participation by School Administrators, by Award Cohort



Source: Participant Survey - Item 29

Figure 8.20B - Reasons Cited for Value of TEP Participation to Administrators



Source: Participant Survey - Item 29

8.13 Perspectives of Those with Administrative Responsibilities

Among those participating in TEP, many indicated that they had administrative responsibilities. As shown in Figure 8.21, 62.2 percent of all participants reported having major administrative responsibilities. Over time, the percentage of participants with administrative responsibilities ranged from 42.9 percent in 1989 to 77.8 percent in 1986.

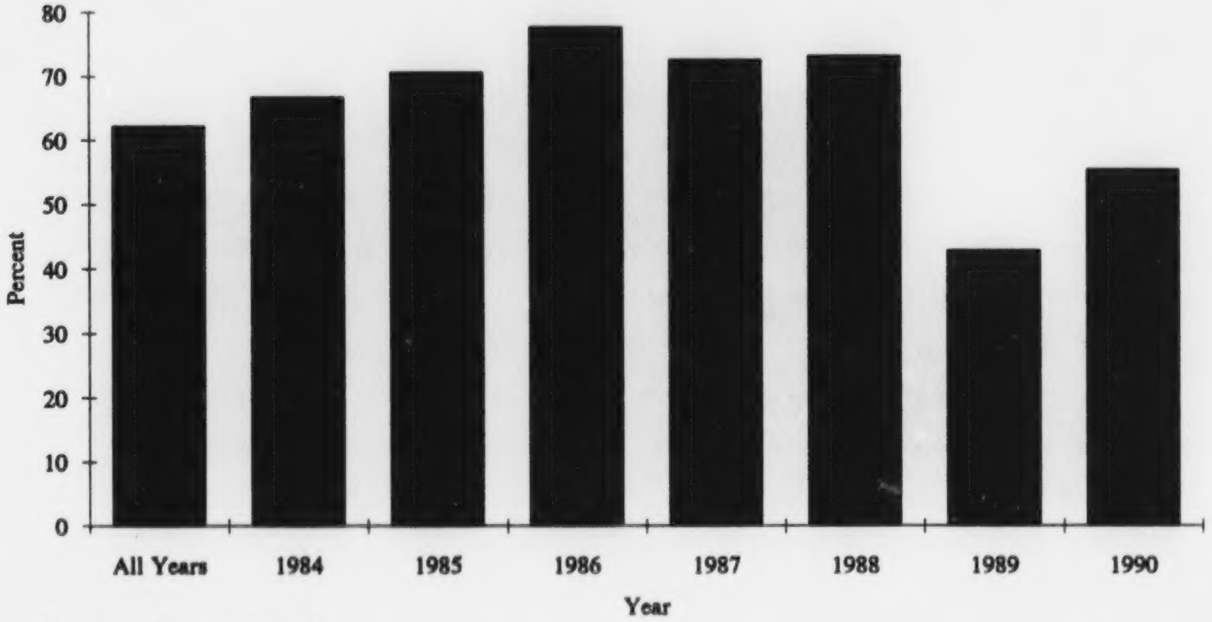
Participants with major administrative responsibilities were also asked what percentage of their time was spent working on administrative matters. As seen in Figure 8.22, participants with administrative responsibilities reported spending an average of half (51.9%) of their time on them. Over time, the proportion of time spent on administrative tasks by participants increased steadily from 20 percent in 1984 to 72 percent in 1988 before dropping to 60 percent by 1990.

The types of administrative activities varied with respect to science and mathematics education. As shown in Figure 8.23, the most common administrative responsibilities cited by participants include being a lead teacher (49.1%), developing and coordinating curriculum (43.9 %), and serving as school or building principal (15.8%). Participants also reported spending 1.8 percent of their time on workshops for other teachers.

Among those with administrative responsibilities, 85.2 percent indicated that their participation had affected their work as educators or supervisors. As seen in Figure 8.24, participants with administrative responsibilities felt that involvement in TEP improved their work (34.6%), increased their knowledge of science education (25.0%), and provided them with contacts and networks (15.4%). A small minority of respondents (3.8%) reported no (or very little) impact in their work as a result of their participation in the TEP program.

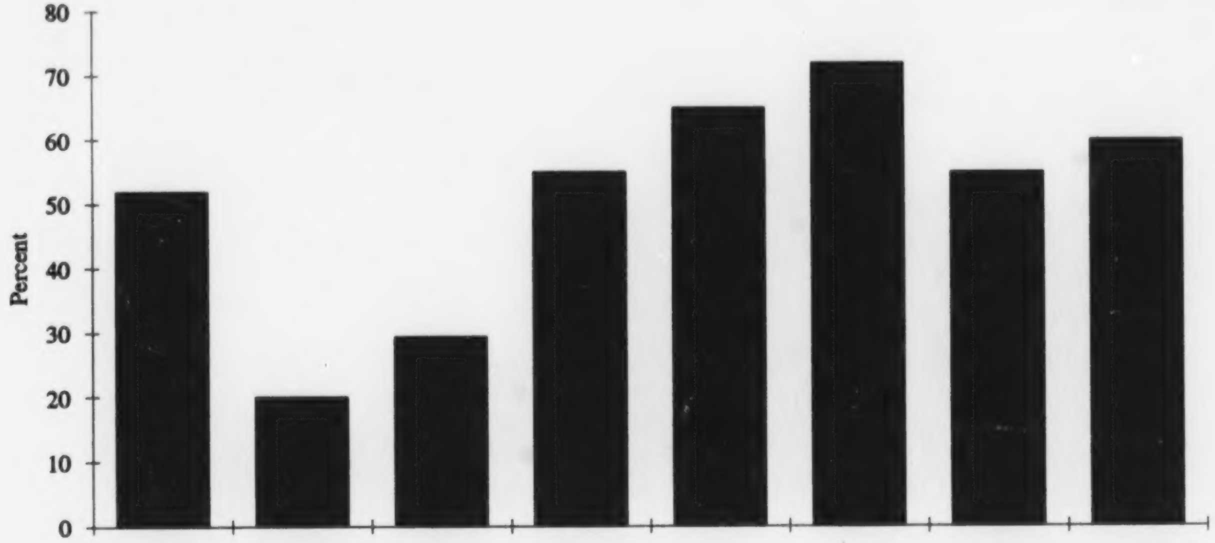
Among those participants who either favor administrator participation in TEP programs or have administrative responsibilities themselves, 44.0 percent indicated that they would like to implement changes in their science or mathematics curricula or methods. As seen in Figure 8.25, the changes cited most frequently include changing teaching styles to include more discussion and hands-on work (46.2%), increasing the number of math and science courses in the curriculum (19.3%), and increasing access to computers and technology (18.5%).

Figure 8.21 - Percent Reporting Major Administrative Responsibilities, by Award Cohort



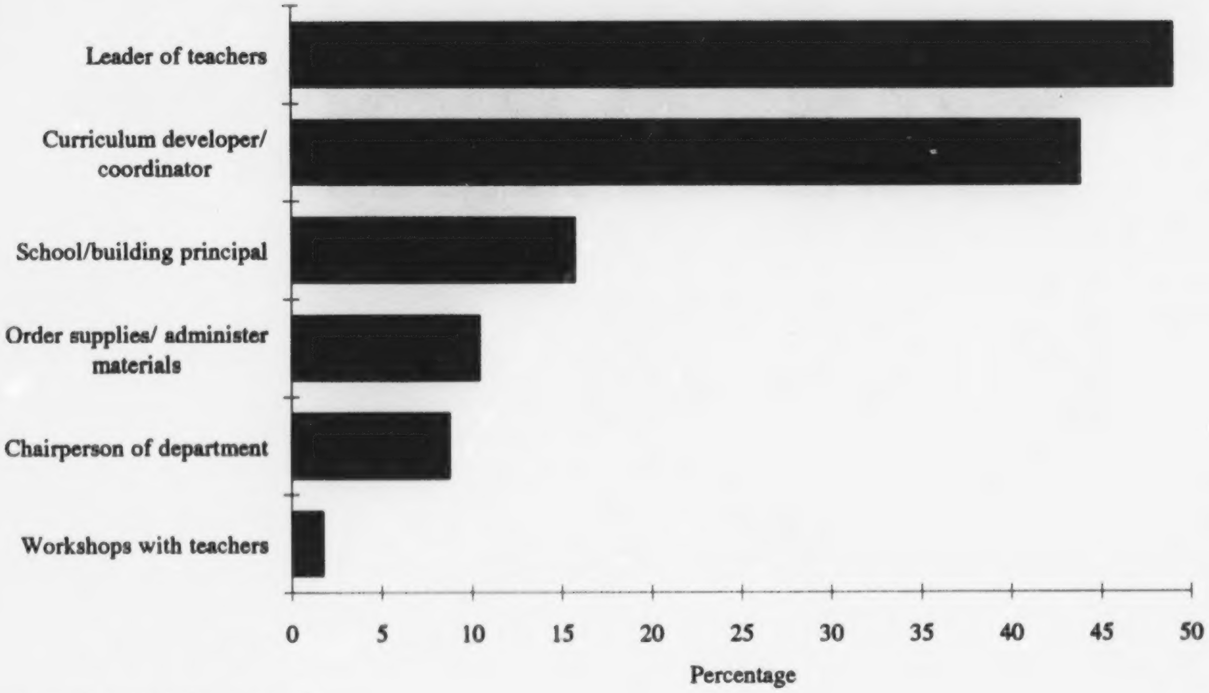
Source: Participant Survey - Item 30

Figure 8.22 - Proportion of Time Spent on Administrative Responsibilities, by Award Cohort



Source: Participant Survey - Item 31

Figure 8.23 - The Nature of the Administrative Responsibilities of TEP Participants



Source: Participant Survey - Item 32

Figure 8.24 - Ways in Which TEP Participation Affected Participants' Work as Educational Administrators or Supervisors

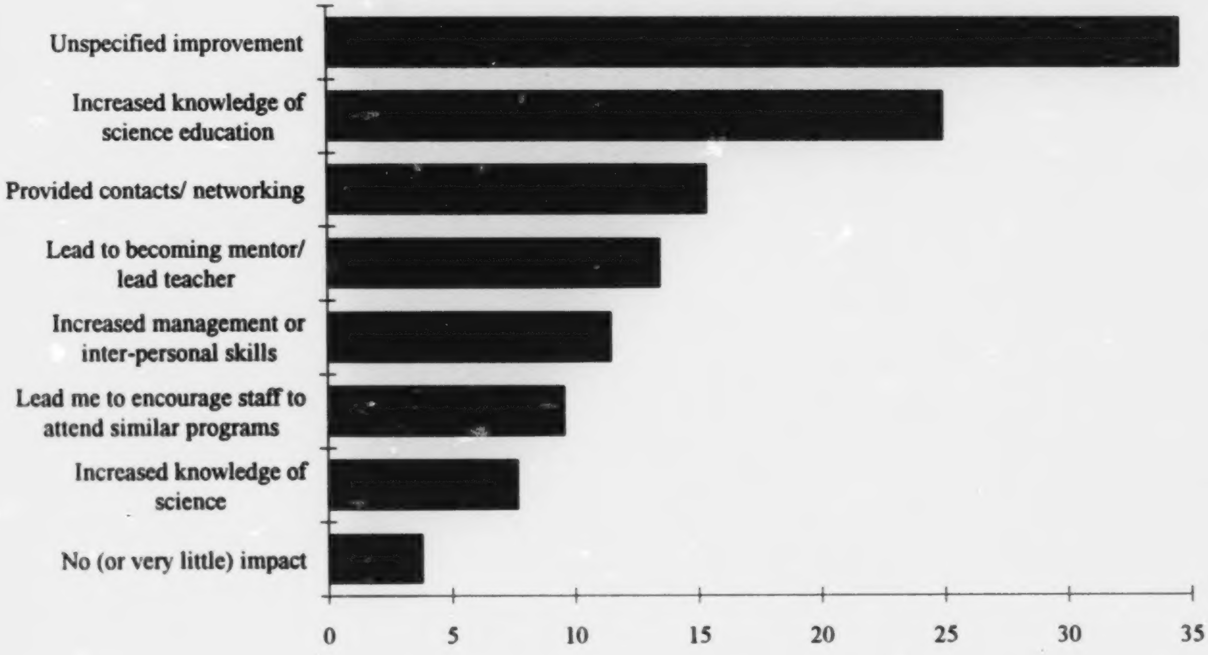
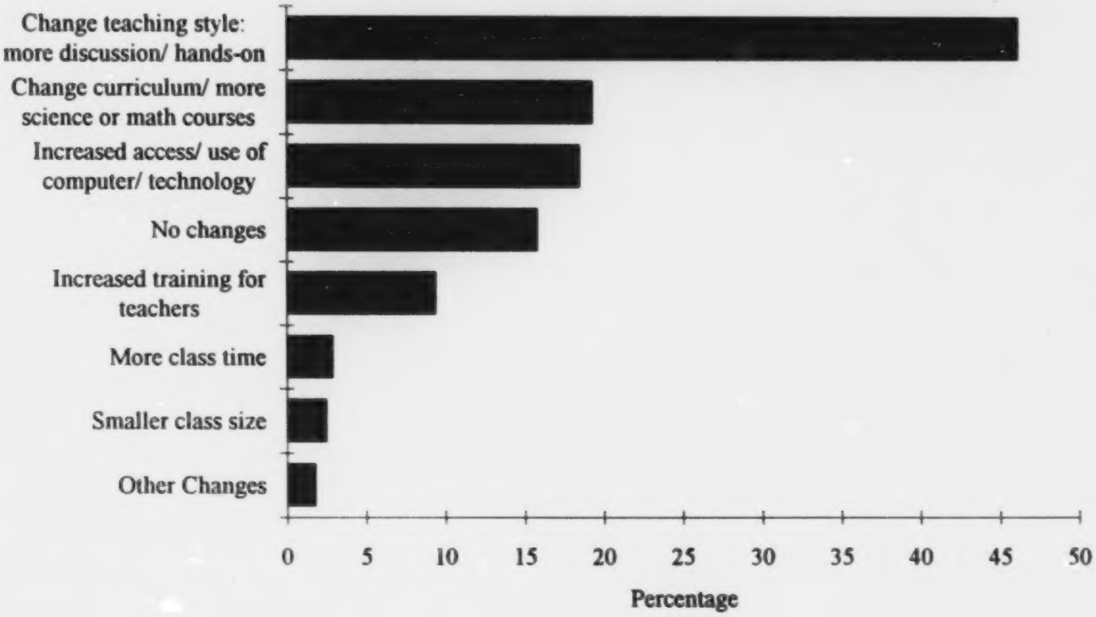


Figure 8.25 - Changes that Participants with Administrative Responsibilities Would Like to Implement as a Result of TEP Participation



9.0 CAREER AND EDUCATIONAL DEVELOPMENT AMONG PARTICIPANTS

9.1 Present Employment

Former TEP participants were asked to indicate their present employment status. As shown in Figure 9.1, 86.4 percent of TEP participants reported that they are still employed as classroom teachers in grades K-12. Participants involved in recent TEP projects were more likely to report that they are still employed as K-12 teachers than participants from earlier cohorts; the percentage of participants employed as teachers increased steadily from 76.9 percent of 1984 cohort participants to 92.8 percent among 1990 cohort participants.

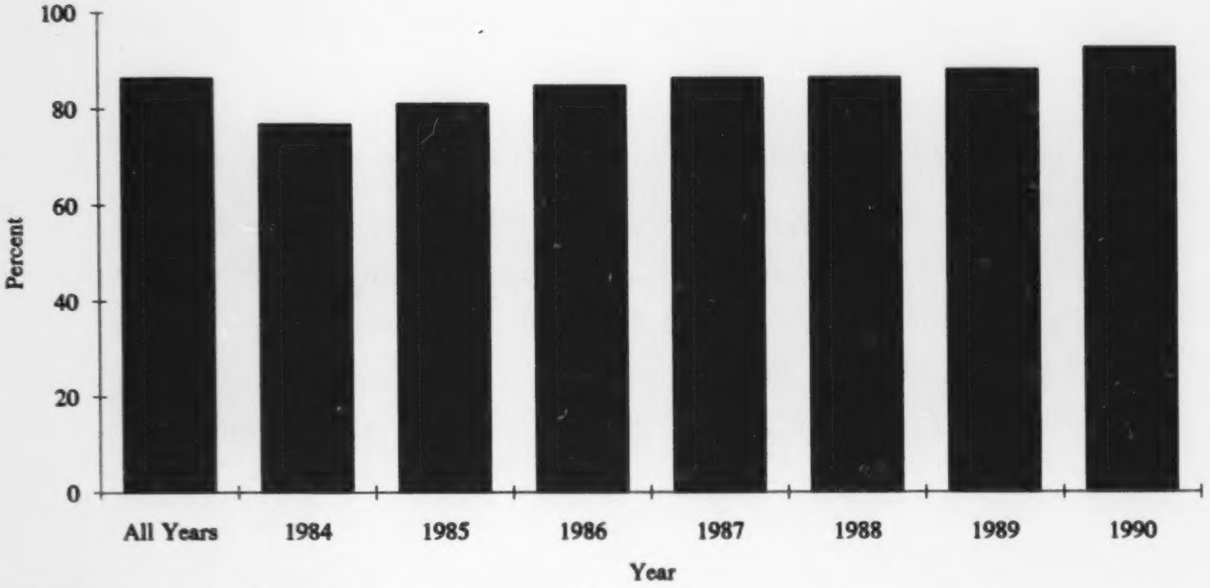
While the great majority of TEP participants are still employed as K-12 teachers, 13.6 percent of participants have changed careers and are now involved in a variety of different pursuits. As seen in Figure 9.2, 5.1 percent of all TEP participants reported that they are not presently employed in any position and 1.5 percent reported being employed in an occupation outside of education. Participants have also moved into non-teaching positions in educational organizations (4.7%), and into teaching positions outside of grades K-12.

In the following two sections, two questions are explored. First, among those who have remained in educational positions, what types of professional development activities have they pursued. Second, among those who have left, what are they now doing.

9.2 Career Development Activities Among TEP Participants who Remained in Education

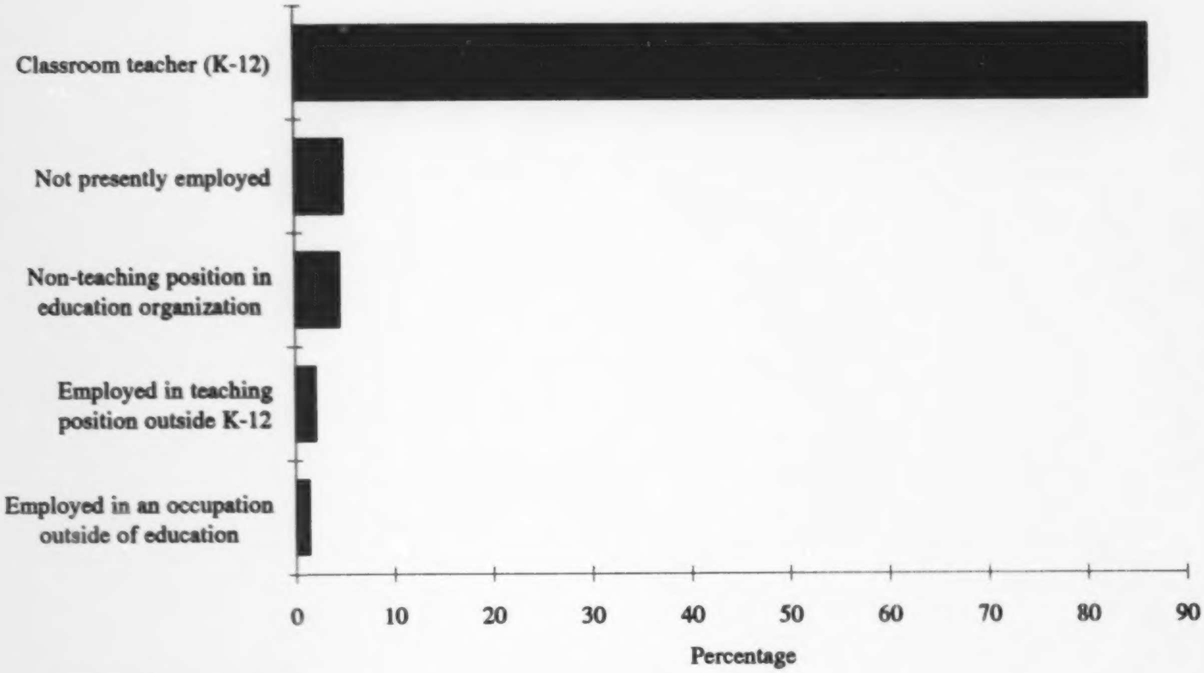
Career development was explored from two perspectives. First, the attainment of leadership positions subsequent to TEP participation. Second, the furthering of education among these individuals.

Figure 9.1 - Current Employment in Education Among Former TEP Participants, by Cohort Group (Percent Reporting Current Employment in K-12 Education)



Source: Participant Survey - Item 19

Figure 9.2 - Employment Status by Category of Former TEP Participants



Source: Participant Survey - Item 19

9.2.1 Promotion to Positions of Leadership

Participants reported on their career and professional development since TEP. As shown in Figure 9.3, many former TEP participants have been promoted to leadership positions, 46.8 percent of participants have been named mentor/master teachers, 40.7 percent have been named subject area department heads, and 25.4 percent have begun serving as science or mathematics curricula specialist since participating in TEP. Former TEP participants have also moved in leading administrative roles, 3.5 percent of TEP participants reported that they have been promoted to principal and 8.0 percent reported that they are now performing other administrative roles in their school districts. Over time, the percentage of TEP participants that have been promoted to leadership positions has remained even.

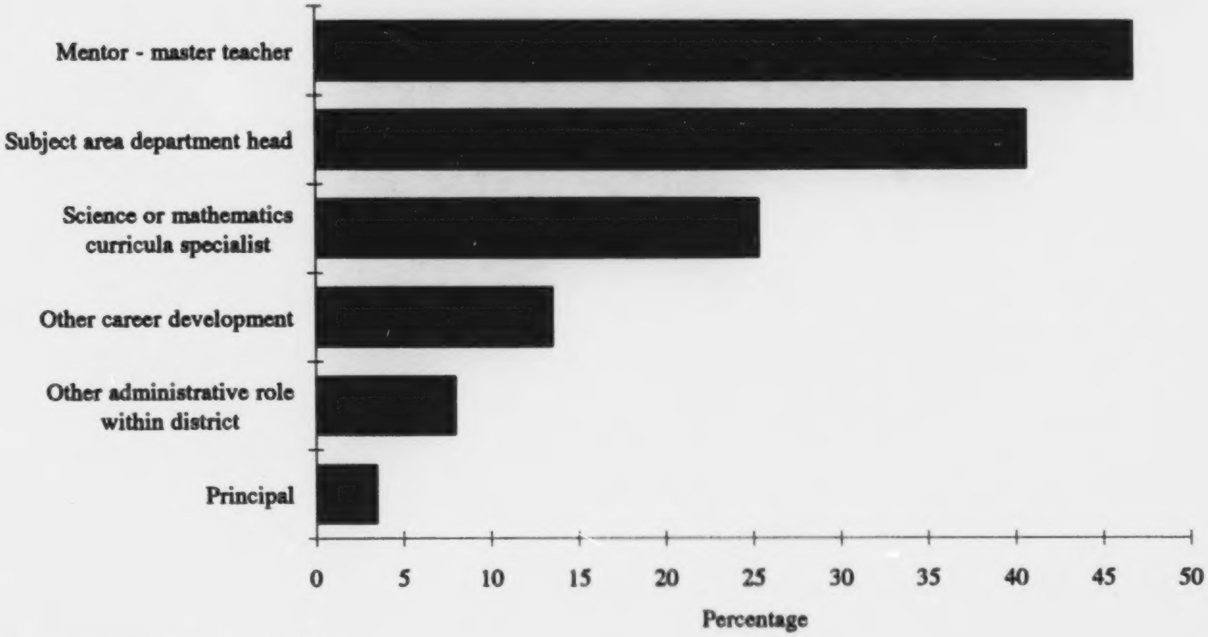
9.2.2 Taking Courses for College Credit

As shown in Figure 9.4, since participation in TEP, 76.9 percent of participants reported that they had taken a course for college credit in the past five years. Over time, the general trend indicates, quite naturally, that participants in more recent cohorts are more likely to have taken a college course for credit in the past five years. The percentage of participants that reported having taken a college course increased steadily from 72.9 percent in 1985 to 80.1 percent in 1990; however, a high of 81.5 percent of 1984 participants reported having taken college courses for credit.

As seen in Figure 9.5, participants reported having taken an average of 3.5 semesters of courses in science and mathematics content over the past five years. Over time, the average number of semester courses taken by participants ranged from 2.7 semesters in 1986 and 1987 to 4.2 semesters in 1989 with no clear trend emerging over time.

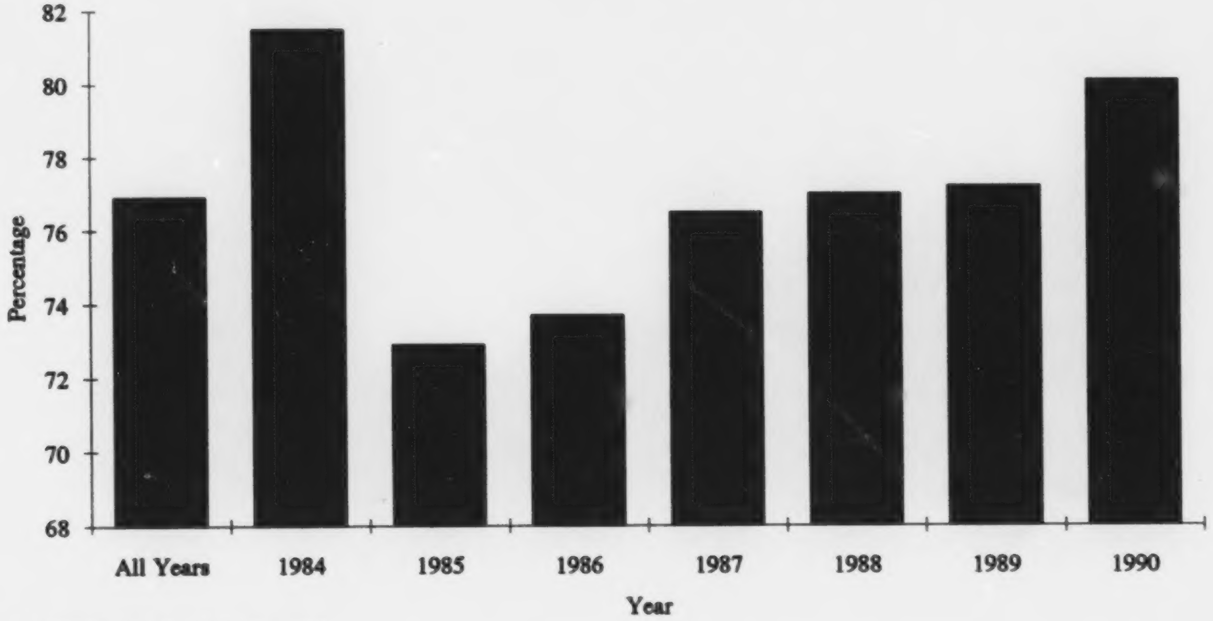
Participants who took science and/or mathematics courses for college credit were asked to identify the subject matter. As shown in Figure 9.6, the most often cited areas of science and mathematics cited by participants included computer science (19.7%), biological science (17.7%), mathematics-not specified (16.3%), science education (16.3%), chemistry (15.6%), physics (13.9%), and mathematics education (13.4%). The subject areas cited least often by participants included engineering, business, the social sciences, and the arts and humanities.

Figure 9.3 - Promotion to Leadership Responsibilities Among Former TEP Participants



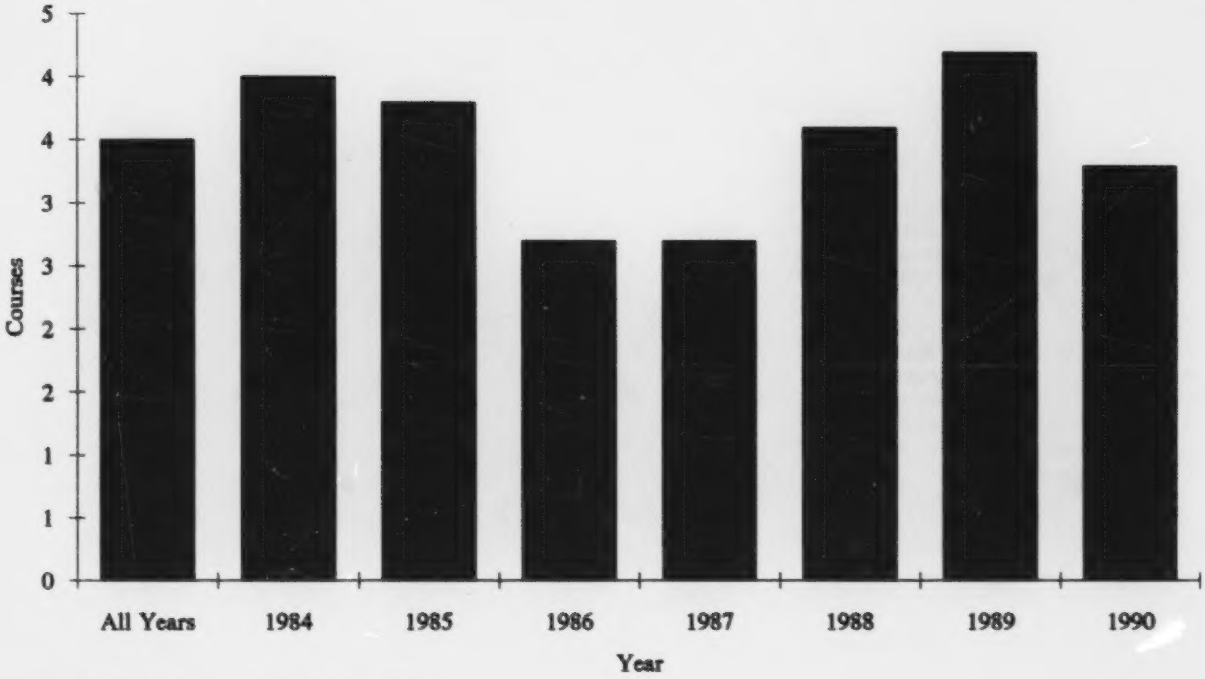
Source: Participant Survey - Item 35

Figure 9.4 - TEP Participants Reporting that They Had Taken Courses for College Credit in the Past Five Years, by Award Cohort



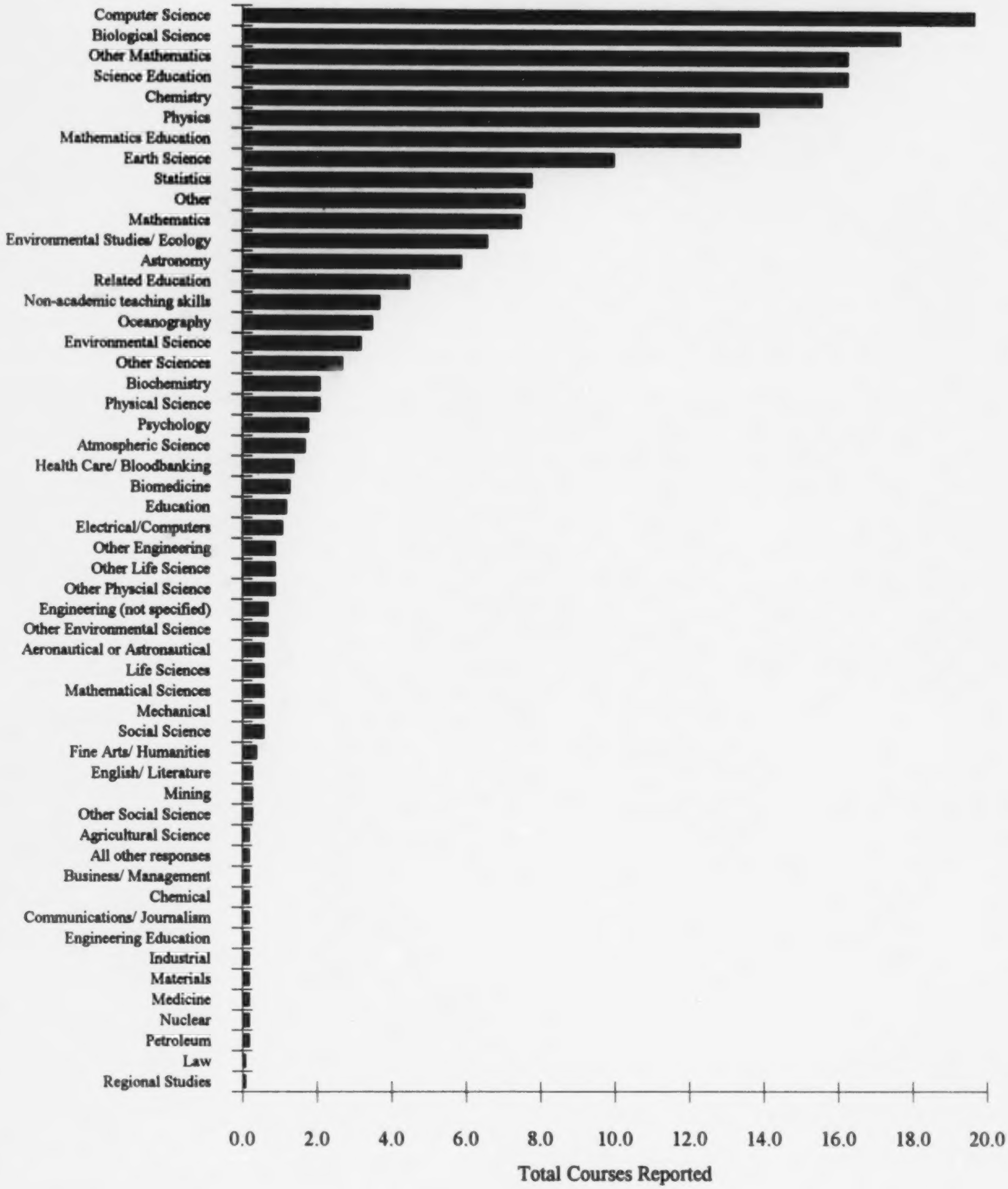
Source: Participant Survey - Item 36

Figure 9.5 - Average Number of Semester Courses Taken in Science, Mathematics and Other Fields in Past Five Years



Source: Participant Survey - Items 37A and 37B

Figure 9.6 - Specific Science or Mathematics Subject Matter of Courses Taken for College Credit



Source: Participant Survey - Item 37C

9.3 *Those Who Left the Field*

Not all TEP participants remained in the field. As shown in Figure 9.7, over the years since the TEP projects, 1.5 percent reported having left the field and 5.1 percent reported that they were not presently employed. Participants in more recent TEP projects are more likely to be unemployed than participants from earlier cohorts.

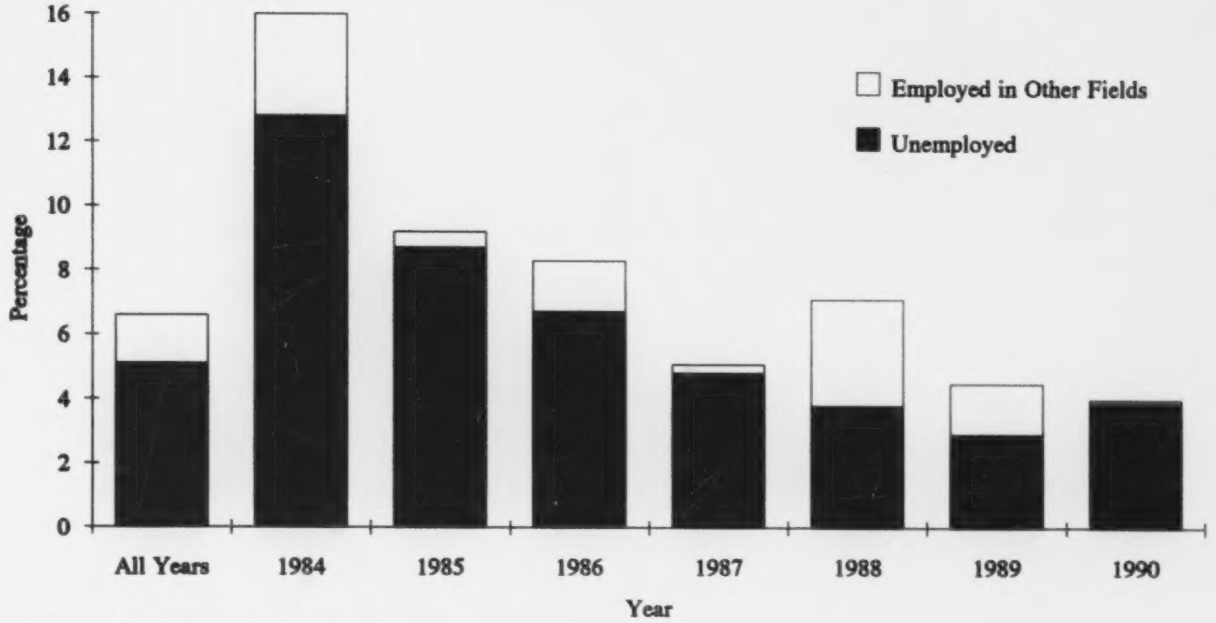
TEP Participants were also asked to indicate the year in which they left the field. As shown in Figure 9.8, most participants that have left K-12 teaching have done so recently. Among TEP participants that have left teaching, 33.2 percent reported leaving teaching in 1991, 23.6 percent of participants left in 1990, and 20.3 percent left in 1989; this percentage decreased steadily over time.

Among those reporting leaving the field of teaching, as seen in Figure 9.9, the most often cited reason (37.7%) was retirement. Participants also cited health concerns and disability (19.9%), burnout (12.7%), and returning to school (11.9%) as important reasons for leaving teaching. Reasons cited less often by participants included being laid off (6.6%), and having a low salary (1.6%).

Participants who were no longer in K-12 educational positions were asked to indicate the present type of employment. As shown in Figure 9.10, among participants that are no longer employed in K-12 teaching, the most common employers are colleges and universities (48.0 percent), junior colleges (25.9 percent), and special schools (23.7 percent). Less than one percent (0.3) percent of participants reported working outside of classroom teaching.

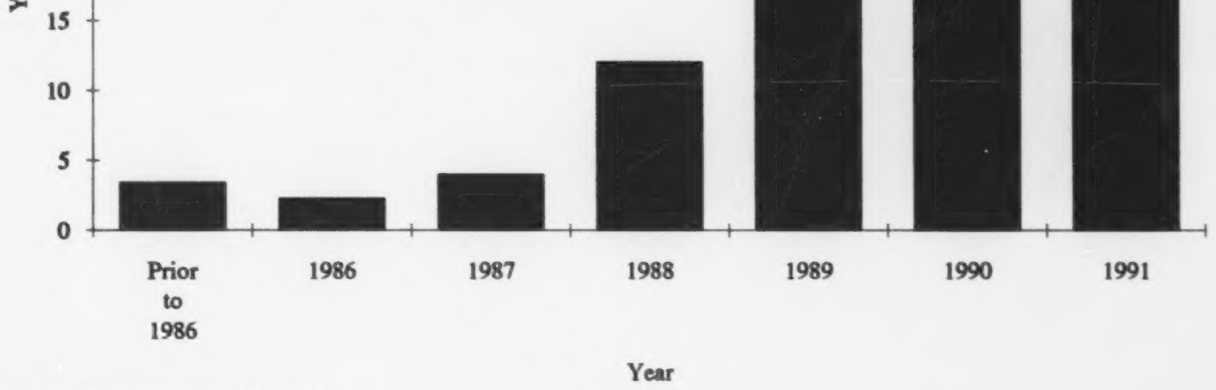
As seen in Figure 9.11, when asked for their job title, 70.0 percent of these participants reported that their position was at either the college or junior college level and 13.6 percent reported that they are teaching and tutoring home bound people.

Figure 9.7 - Unemployment or Employment in Other Fields, Among Former TEP Participants, by Award Cohort



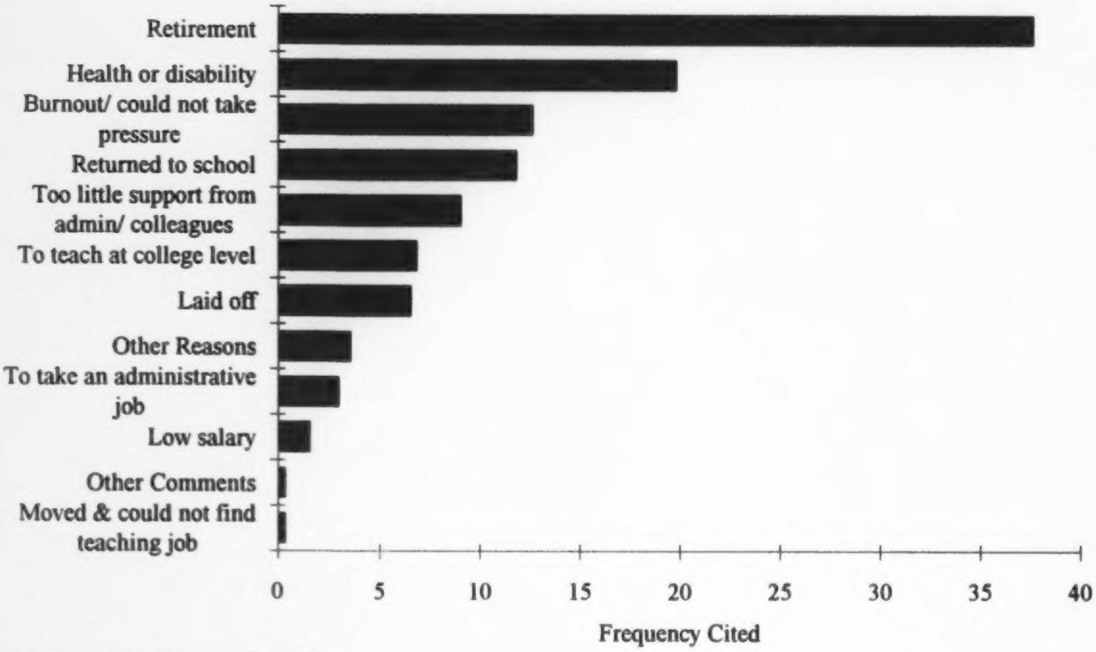
Source: Participant Survey - Item 19

Figure 9.8 - Year that TEP Participant Left Education



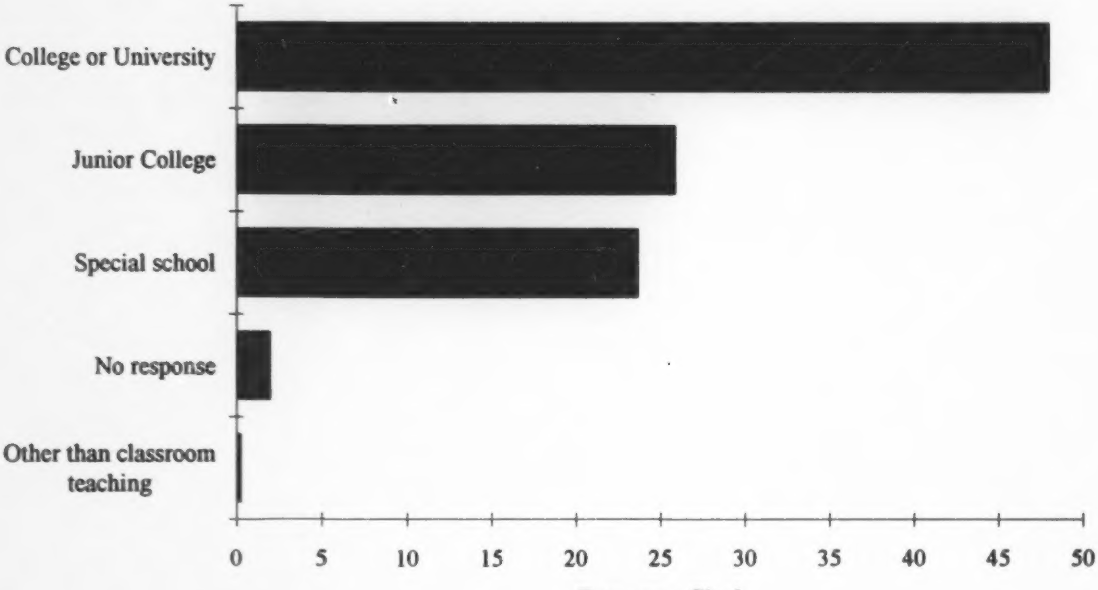
Source: Participant Survey - Item 21

Figure 9.9 - Major Reasons Cited for Leaving Field



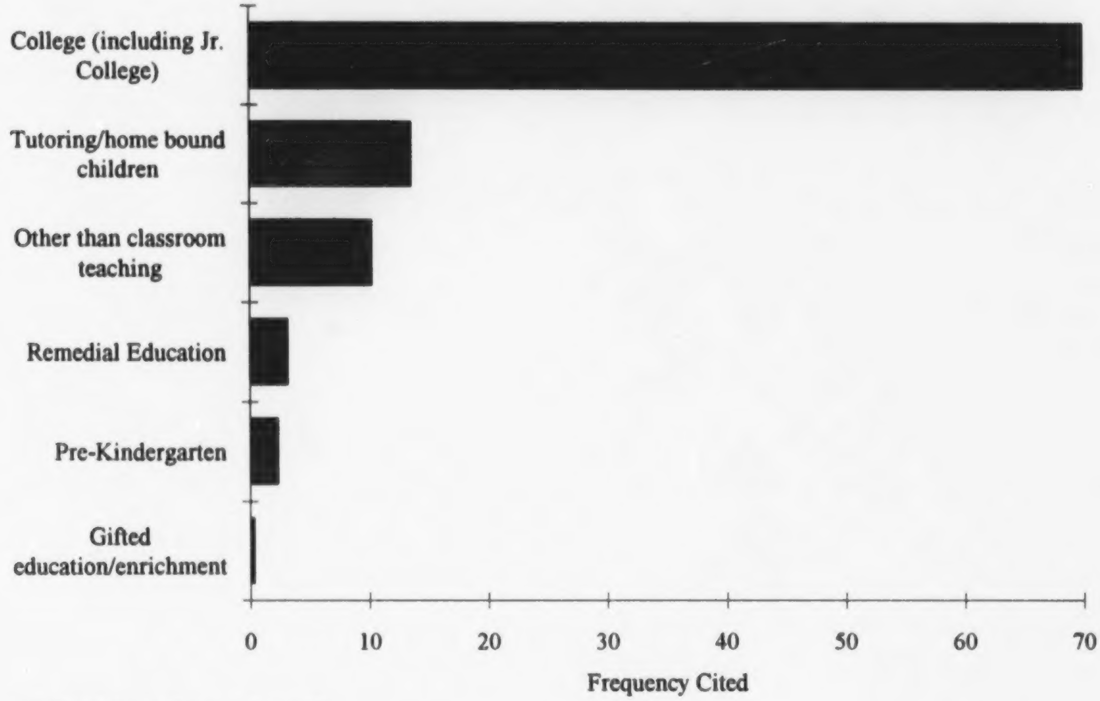
Source: Participant Survey - Item 22

Figure 9.10 - Type of Employer for TEP Participants No Longer in Education



Source: Participant Survey - Item 20

Figure 9.11 - Job Title Among Those Employed Outside of Education



Source: Participant Survey: Item 20

PART FIVE

RELATIONSHIPS AMONG THE VARIABLES

10.0 RELATIONSHIPS AMONG THE VARIABLES

In the preceding chapters, various characteristics of TEP PIs and participants, TEP project operations, and outcomes and impacts have been discussed. This chapter examines the relationships among selected characteristics among both of the groups. This Chapter is divided into two sections. First, we explore relationships with respect to participants in the project. Second, we examine various relationships with respect to the PIs.

10.1 TEP Participants

This section explores relationships between selected outcome measures reported by participating teachers and the characteristics of the projects those teachers attended. It also provides a more detailed analysis of the joint relationship between teacher characteristics, project characteristics, and teacher outcomes. The following project characteristics were identified as potentially related to overall project success:

- Grade level(s) taught by project participants
- Subject matter taught by project participants
- Number of teacher participants
- Whether project staff attempted to remain in contact with participants
- Whether recruitment was limited to local area teachers
- Calendar year of teacher participation
- Fraction of participants who were members of minority groups.

The sample of teacher participants was stratified to ensure that sufficient numbers of respondents were obtained from each group to permit statistically valid comparisons. Data from project awardee responses were electronically linked to teacher information to provide a teacher-level file which incorporated project attributes.

Teachers' responses to impact-related questions were analyzed by multivariate analysis of variance (MANOVA) to test whether project attributes, or combinations of project attributes, were significantly related to teacher response levels. For example, Teacher Question 8 lists 21 statements with which teachers can register varying degrees of agreement ranging from "Not true," and "Seldom true" to "Very true." The 21 variables formed by ratings of these statements formed the dependent variables of the MANOVA, and the levels of the 7 project attributes listed above formed the independent variables. Other teacher characteristics -- particularly grade level of teaching assignment -- were often strongly correlated with responses to outcome questions; when this was so, these characteristics were entered into the MANOVA as covariates.

The detailed tables presented in this section were constructed after the analysis was completed to illustrate effects which the MANOVA indicated to be statistically significant. Only associations which met a 99% confidence level are discussed in this section.

Four general areas of were explored in detail with respect to TEP participants. These include:

- Participant Goals for their Projects;
- Participant Ratings of Project Quality;
- Participant Ratings of Project Results; and
- Participant Reports of Barriers to the Use of TEP Ideas

10.1.1 Participant Goals for their Projects

TEP participants shared several major goals when they decided to join the project (see Table 10.1). Sixty percent or more of participants rated each of the following goals as "very important" (the highest scale rating available to them):

- Develop ways to enhance student interest
- Gain experience with hands-on activities
- Increase knowledge of applications of principles
- Improve knowledge of science/math content
- Develop additional teaching skills

No major subgroup of teachers departed significantly from the majority consensus in support of these goals.

Table 10.1
Goals which motivated teachers to participate in TEP

How important were ... in your decision?	Not Important	...	Moderately Important	...	Very Important
Develop ways to enhance student interest	.5%	.8%	6.0%	19.5%	73.3%
Gain experience with hands-on activities	1.1%	1.1%	7.9%	21.3%	68.5%
Increase knowledge of applications of principles	1.1%	1.0%	9.2%	23.7%	64.9%
Improve knowledge of science/math content	1.7%	3.1%	12.2%	20.0%	63.1%
Develop additional teaching skills	.6%	1.6%	9.5%	26.9%	61.4%
Develop or refine teaching materials	1.0%	1.7%	12.1%	32.2%	53.0%
Learn to update teaching practices with new methods	1.3%	2.7%	12.5%	29.5%	53.9%
Increase knowledge of cutting-edge research	3.9%	8.4%	19.3%	26.1%	42.2%
Integrate science and mathematics instruction	6.4%	11.7%	27.8%	27.2%	26.9%
Learn ways to motivate female, minority, or disabled	10.1%	13.1%	27.7%	22.2%	26.9%
Integrate science or math with other subjects	7.7%	15.1%	28.8%	24.9%	23.5%
Earn continuing education credits	29.0%	14.1%	20.3%	17.3%	19.3%
Develop ability to lead in-service programs	13.4%	19.3%	27.9%	21.7%	17.8%
Develop ability to work with other resources	11.9%	18.5%	28.8%	25.4%	15.5%
Earn credits toward a graduate degree	52.3%	16.6%	12.1%	8.0%	10.9%

Other goals, however, were more divisive. Overall, only 27 percent of teachers thought that learning to motivate female, minority, or disabled students was very important. Among teachers who were themselves members of a minority group, however, 58% rated this as a very important goal influencing them to participate in TEP, compared to 23% of non-minority teachers (see Table 10.2). A quarter of the white respondents thought this goal did not rise even to "moderate" importance. (Only 9 percent of minority teachers rated it this low.)

Both black and white teachers expressed support for this goal in direct relation to the number of minority children in the student bodies of the schools where they taught (see Table 10.3). More than half of the teachers in schools with predominately (90% or over) minority enrolment thought motivating these students was very important, while fewer than a quarter of those in schools with 65% or higher non-minority enrolment thought so. Two other school attributes were also correlated with response to this goal: urban school locations, and fraction of students eligible for free or subsidized lunches. Both of these variables are highly correlated with the fraction of minority children in the student body.

Women gave this goal substantially higher importance than did men; one third of the women thought it was very important, compared to one fifth of the men.

Teachers in poor, urban, or predominately minority schools, and teachers who were themselves members of minority groups were much more strongly motivated by the prospect of developing the ability to mobilize other resources than were their wealthier counterparts (see Table 10.4). In schools where nearly all (over 75%) of the students met the eligibility criteria for free or reduced price lunches, 27 percent of the teachers thought this was an important goal, while in schools with few such students, and in predominately white schools (65% or higher), only 10-13 percent thought so. Minority teachers were substantially more influenced by this goal (30% very important) than white teachers (13½ percent).

Teachers at different grade levels had substantially different motivational patterns for participation (see Table 10.5). Nearly half of the high school teachers thought that "[increasing] knowledge of cutting edge research" was a very important goal, while only a quarter of teachers of grades K through 4 rated it this high (see Table 10.6). In contrast, 43 percent of the K through 4 teachers thought that learning how to integrate science or math with other subjects was very important, while at the high school level only 16 percent of teachers thought so (see Table 10.7). Elementary teachers also attached higher importance to "gain[ing] experience with hands-on activities" and "develop[ing] ways to enhance student interest" than did high school teachers.

Table 10.2

Importance of Selected Goals in Teachers' Decisions To Participate in the TEP Project, By Teacher Characteristics

	Learn ways to motivate female, minority, or disabled				
	Not Important	...	Moderately Important	...	Very Important
What is your sex?					
Male	14.6%	15.9%	30.4%	19.9%	19.2%
Female	6.8%	10.8%	25.7%	24.1%	32.7%
What is your race/ethnicity?					
White, not of Hispanic origin	11.0%	14.0%	29.8%	22.7%	22.6%
Minority	3.8%	5.2%	13.9%	19.5%	57.5%
Location					
City	7.8%	9.2%	25.2%	23.2%	34.6%
Suburban	13.0%	15.6%	27.4%	22.6%	21.4%
Rural	10.2%	15.2%	31.2%	20.1%	23.3%
Students eligible for reduced price lunches					
0 to 25%	13.9%	15.4%	29.2%	21.8%	19.7%
26% to 50%	8.0%	13.5%	30.8%	23.2%	24.4%
51% to 75%	5.3%	9.2%	25.0%	23.6%	37.0%
76% to 100%	5.2%	5.2%	17.6%	20.4%	51.6%
Students who are White, not Hispanic					
1 percent	1.4%	7.1%	11.4%	24.3%	55.7%
5	6.9%	1.7%	13.8%	29.3%	48.3%
10	2.5%	7.5%	22.5%	17.5%	50.0%
20	6.6%	9.9%	20.2%	25.2%	38.0%
50	3.4%	10.1%	28.6%	24.4%	33.6%
65	8.0%	12.6%	32.1%	22.7%	24.6%
85	14.0%	13.6%	23.6%	27.2%	21.6%
90	11.2%	11.9%	32.8%	25.7%	18.3%
95	14.9%	18.1%	32.4%	17.4%	17.2%
100	17.1%	20.9%	33.3%	17.8%	10.9%

Table 10.3

Importance of Motivating Female, Minority, or Disabled Students, By Race of Teacher and Students in Teacher's School

Learn ways to motivate female, minority, or disabled **Very Important**	What is your race/ethnicity?	
	White, not of Hispanic origin	Minority
Students who are White, not Hispanic		
1 percent	38.5%	65.1%
5	46.3%	52.9%
10	38.5%	66.7%
20	31.0%	54.5%
50	32.0%	43.8%
65	22.1%	54.3%
85	19.9%	58.3%
90	18.1%	28.6%
95	16.9%	36.4%
100	11.1%	

Table 10.4

Importance of Selected Goals in Teachers' Decisions To Participate in the TEP Project, By Teacher Characteristics

	Develop ability to work with other resources				
	Not Important	...	Moderately Important	...	Very Important
Level of current teaching assignment					
K - 4	9.2%	18.7%	28.6%	27.2%	16.3%
5 - 8	10.4%	15.1%	32.3%	24.5%	17.7%
9 - 12	14.5%	19.9%	27.3%	24.9%	13.4%
What is your sex?					
Male	13.0%	19.4%	30.3%	24.3%	12.9%
Female	10.9%	17.7%	27.9%	26.2%	17.4%
What is your race/ethnicity?					
White, not of Hispanic origin	12.7%	19.8%	29.8%	24.1%	13.5%
Minority	5.3%	8.4%	22.8%	33.3%	30.2%
Location					
City	8.8%	17.0%	29.0%	27.8%	17.4%
Suburban	15.1%	20.5%	26.0%	25.2%	13.1%
Rural	11.7%	18.3%	32.1%	22.9%	15.1%
Students eligible for reduced price lunches					
0 to 25%	14.6%	20.6%	29.0%	24.6%	11.3%
26% to 50%	10.4%	19.6%	31.0%	24.4%	14.5%
51% to 75%	7.8%	13.2%	33.1%	26.0%	19.9%
76% to 100%	7.2%	14.5%	22.5%	28.5%	27.3%
White, not Hispanic					
1	1.4%	9.9%	26.8%	33.8%	28.2%
5	8.8%	15.8%	21.1%	29.8%	24.6%
10	10.3%	10.3%	38.5%	23.1%	17.9%
20	9.5%	13.6%	30.2%	26.4%	20.2%
50	9.2%	20.2%	21.0%	30.3%	19.3%
65	10.1%	22.3%	32.2%	25.1%	10.3%
85	14.2%	18.6%	27.9%	27.5%	11.7%
90	13.5%	21.0%	27.0%	25.1%	13.5%
95	15.0%	19.1%	31.0%	22.0%	13.0%
100	15.4%	21.5%	30.0%	21.5%	11.5%

Table 10.5

Goals Which Motivated Teachers to Participate in TEP, by Current Teaching Assignment

Goals ranked as very important	Level of current teaching assignment		
	K - 4	5 - 8	9 - 12
Develop ways to enhance student interest	87.2%	80.4%	69.6%
Gain experience with hands-on activities	83.5%	76.6%	63.3%
Improve knowledge of science/math content	68.1%	66.5%	63.7%
Increase knowledge of applications of principles	68.1%	67.1%	66.8%
Develop additional teaching skills	66.3%	69.5%	58.4%
Learn to update teaching practices with new methods	56.0%	57.9%	54.6%
Develop or refine teaching materials	55.7%	55.2%	53.8%
Integrate science and mathematics instruction	44.7%	28.2%	20.3%
Integrate science or math with other subjects	44.0%	24.7%	16.5%
Learn ways to motivate female, minority, or disabled	32.6%	31.9%	22.9%
Increase knowledge of cutting-edge research	26.4%	40.7%	48.6%
Earn continuing education credits	26.4%	20.4%	18.0%
Develop ability to work with other resources	16.8%	18.2%	13.9%
Develop ability to lead in-service programs	15.4%	20.6%	14.3%
Earn credits toward a graduate degree	11.4%	12.8%	9.9%

Table 10.6

Importance of Selected Goals in Teachers' Decisions To Participate in the TEP Project, By Teacher Characteristics

	Increase knowledge of cutting-edge research				
	Not Important	...	Moderately Important	...	Very Important
Level of current teaching assignment					
K - 4	7.4%	14.2%	23.4%	29.4%	25.5%
5 - 8	3.7%	8.8%	20.9%	27.0%	39.5%
9 - 12	3.4%	7.6%	17.5%	24.6%	47.0%
What is your sex?					
Male	3.7%	7.7%	19.5%	28.4%	40.6%
Female	4.2%	8.8%	18.8%	24.6%	43.6%
What is your race/ethnicity?					
White, not of Hispanic origin	3.8%	8.8%	19.8%	26.3%	41.3%
Minority	4.9%	4.6%	15.2%	25.8%	49.5%
Location					
City	4.3%	9.3%	21.3%	25.1%	40.0%
Suburban	4.1%	8.5%	17.5%	27.8%	42.0%
Rural	3.1%	7.3%	18.7%	25.7%	45.2%
Students eligible for reduced price lunches					
0 to 25%	4.4%	8.9%	19.2%	26.6%	41.1%
26% to 50%	3.7%	8.4%	19.8%	28.2%	39.9%
51% to 75%	2.1%	8.2%	17.9%	25.7%	46.1%
76% to 100%	3.6%	6.8%	21.7%	23.7%	44.2%
White, not Hispanic					
1		7.2%	11.6%	24.6%	56.5%
5	5.3%	5.3%	17.5%	29.8%	42.1%
10		5.1%	15.4%	35.9%	43.6%
20	4.1%	8.3%	21.2%	20.3%	46.1%
50	5.9%	11.8%	17.6%	25.2%	39.5%
65	3.8%	8.5%	20.2%	26.3%	41.3%
85	4.4%	10.4%	14.8%	24.8%	45.6%
90	3.3%	7.4%	21.2%	34.9%	33.1%
95	3.8%	7.7%	18.2%	25.8%	44.5%
100	3.9%	9.4%	24.2%	26.6%	35.9%

Table 10.7

Importance of Selected Goals in Teachers' Decisions To Participate in the TEP Project, By Teacher Characteristics

	Integrate science or math with other subjects				
	Not Important	...	Moderately Important	...	Very Important
Level of current teaching assignment					
K - 4	1.8%	5.4%	20.0%	30.0%	42.9%
5 - 8	5.1%	11.8%	29.3%	29.9%	24.0%
9 - 12	11.3%	19.7%	31.9%	21.2%	16.0%
What is your sex?					
Male	9.7%	19.2%	30.1%	24.7%	16.2%
Female	6.0%	12.0%	27.9%	25.0%	29.1%
What is your race/ethnicity?					
White, not of Hispanic origin	8.1%	16.3%	30.8%	24.2%	20.5%
Minority	3.2%	5.7%	15.2%	29.7%	46.3%
Location					
City	6.7%	12.3%	25.9%	26.6%	28.5%
Suburban	8.5%	18.9%	29.7%	23.5%	19.4%
Rural	7.9%	14.7%	31.3%	24.2%	21.9%
Students eligible for reduced price lunches					
0 to 25%	9.2%	18.1%	30.8%	22.3%	19.6%
26% to 50%	6.7%	14.9%	30.8%	27.3%	20.4%
51% to 75%	5.7%	11.0%	25.3%	29.9%	28.1%
76% to 100%	4.4%	5.2%	20.6%	25.4%	44.4%
White, not Hispanic					
1	5.7%	2.9%	18.6%	32.9%	40.0%
5	6.9%		20.7%	32.8%	39.7%
10		10.5%	21.1%	21.1%	47.4%
20	6.7%	13.0%	29.3%	20.5%	30.5%
50	5.0%	16.8%	25.2%	30.3%	22.7%
65	5.9%	15.5%	30.4%	28.8%	19.4%
85	8.0%	18.1%	31.3%	22.1%	20.5%
90	7.8%	17.9%	36.2%	18.3%	19.8%
95	10.6%	18.6%	27.6%	24.7%	18.5%
100	11.6%	17.1%	32.6%	24.0%	14.7%

In most respects, teachers of middle grades rated goals intermediate between lower grades and high school teachers. They depart from this pattern only in their interest in leading in-service training programs.

Teachers in rural schools differed from those in cities and suburbs in their goals for enhancing their personal credentials. Although no group gave very high ratings to earning continuing education or graduate degree credits, rural teachers' ratings averaged significantly higher than those of teachers in urban or suburban settings (see Table 10.8).

Some goals, while not broadly shared, seemed unrelated to teacher, school, or program characteristics. For example, about half of the teachers in each group examined reported that developing teaching materials was a very important goal (see Table 10.9).

10.1.2 Participant Ratings of Project Quality

Teachers were asked to rate the project they attended on 8 specific and one general quality indicators. Most teachers rated their projects as excellent on most indicators, so this item did not reveal many detailed differences among teachers or project types. In addition, ratings on each specific rating item were highly correlated with the respondent's general rating of "the overall quality of the program" (see Table 10.10). Among the individual items, responsiveness of staff to participants stands out as most highly correlated with overall satisfaction.

Teacher ratings were influenced by the subject matter covered by the project, the grade levels targeted by project administrators (see Table 10.11), and the teachers' stated goals in attending the project (see Table 10.12). Other factors, such as the size and ethnic composition of the participating teacher population, and the scope of project recruitment, were not generally related to expressed teacher satisfaction on this item (see Tables 10.13 - 10.16).

On most of the scales, projects which focussed on either math or science instruction were rated higher than those which targeted both, or whose subject matter could not be determined. Among projects which specifically targeted either math or science, those which also specifically targeted a narrow range of grade levels tended to receive higher satisfaction ratings than those which recruited teachers from all grade levels (or whose grade levels could not be determined).

Table 10.8

Importance of Selected Goals in Teachers' Decisions To Participate in the TEP Project, By Teacher Characteristics

	Earn credits toward a graduate degree				
	Not Important	...	Moderately Important	...	Very Important
Level of current teaching assignment					
K - 4	47.8%	15.9%	14.9%	10.1%	11.2%
5 - 8	47.7%	18.2%	12.2%	9.3%	12.6%
9 - 12	56.4%	15.7%	11.3%	6.9%	9.6%
What is your sex?					
Male	56.5%	16.6%	11.0%	7.0%	9.0%
Female	49.3%	16.5%	13.0%	8.9%	12.3%
What is your race/ethnicity?					
White, not of Hispanic origin	54.5%	16.4%	11.8%	7.3%	10.0%
Minority	36.8%	18.2%	14.6%	13.6%	16.8%
Location					
City	49.9%	17.6%	12.7%	9.5%	10.3%
Suburban	58.9%	17.6%	9.2%	5.5%	8.7%
Rural	46.8%	13.8%	15.9%	9.6%	14.0%
Students eligible for reduced price lunches					
0 to 25%	56.4%	16.2%	10.9%	7.2%	9.3%
26% to 50%	49.8%	18.3%	13.2%	8.4%	10.3%
51% to 75%	45.3%	18.7%	15.5%	9.4%	11.2%
76% to 100%	39.2%	15.5%	14.3%	11.0%	20.0%
White, not Hispanic					
1	42.0%	21.7%	13.0%	10.1%	13.0%
5	35.7%	17.9%	16.1%	17.9%	12.5%
10	47.4%	18.4%	10.5%	5.3%	18.4%
20	49.0%	15.9%	15.9%	8.4%	10.9%
50	54.6%	14.3%	12.6%	8.4%	10.1%
65	53.2%	18.4%	12.7%	6.6%	9.2%
85	54.5%	19.5%	9.8%	7.3%	8.9%
90	60.0%	15.1%	12.1%	7.2%	5.7%
95	55.5%	14.5%	10.7%	8.4%	10.9%
100	49.6%	14.2%	12.6%	6.3%	17.3%

Table 10.9

Importance of Selected Goals in Teachers' Decisions To Participate in the TEP Project, By Teacher Characteristics

	Develop or refine teaching materials				
	Not Important	...	Moderately Important	...	Very Important
Level of current teaching assignment					
K - 4	.7%	1.8%	10.2%	33.6%	53.7%
5 - 8	1.1%	1.1%	10.7%	33.7%	53.5%
9 - 12	1.0%	2.0%	13.5%	31.8%	51.8%
What is your sex?					
Male	1.0%	2.0%	13.7%	34.7%	48.7%
Female	1.0%	1.5%	10.9%	30.4%	56.3%
What is your race/ethnicity?					
White, not of Hispanic origin	1.0%	1.8%	12.0%	33.7%	51.5%
Minority	1.0%	1.0%	10.5%	21.7%	65.7%
Location					
City	1.1%	1.9%	11.9%	29.8%	55.2%
Suburban	1.3%	2.2%	13.0%	32.3%	51.2%
Rural	.3%	.6%	10.8%	35.7%	52.6%
Students eligible for reduced price lunches					
0 to 25%	.9%	1.9%	11.0%	33.1%	53.1%
26% to 50%	.7%	1.8%	12.7%	35.2%	49.6%
51% to 75%	.4%	1.8%	13.8%	33.9%	50.2%
76% to 100%	1.2%	.8%	12.8%	26.4%	58.8%
White, not Hispanic					
1	1.4%		7.1%	34.3%	57.1%
5	3.4%	1.7%	10.3%	37.9%	46.6%
10			12.2%	31.7%	56.1%
20	2.5%	1.7%	15.3%	27.7%	52.9%
50	.8%	.8%	10.9%	27.7%	59.7%
65	.2%	2.1%	12.4%	32.2%	53.0%
85		.4%	11.6%	31.7%	56.2%
90	.7%	3.0%	11.6%	31.7%	53.0%
95	1.6%	1.4%	10.0%	36.4%	50.5%
100		4.7%	14.0%	34.9%	46.5%

Table 10.10

Correlations between participant ratings of general and specific measures of project quality

	The overall quality of the program
Relevance of the content to teaching	.5601
Knowledge of staff members: content	.5469
Knowledge of staff members: schools	.5489
Quality of printed materials used	.5437
Clarity of labs and other hands-on activity	.6113
Usefulness of labs or other hands-on activity	.5262
Adequacy of lab space and other facilities	.4716
Responsiveness of staff to participants	.6906

Table 10.11
Participant Ratings of TEP Project, by Project Focus and Teacher Grade Assignment

	Subject matter taught by intended participants					
	Math		Science		Both*	
Level of current teaching assignment K - 4	Range of grades for participants		Range of grades for participants		Range of grades for participants	
Percent giving excellent rating	Single level	All levels	Single level	All levels	Single level	All levels
Relevance of the content to teaching assignments	83.9%	47.8%	52.6%	50.0%	53.8%	54.5%
Knowledge of staff members: content, subject matter	100.0%	91.3%	84.2%	83.3%	91.3%	95.5%
Knowledge of staff members: schools and teaching	90.3%	43.5%	47.4%	83.3%	53.8%	50.0%
Quality of printed materials used	61.3%	47.8%	63.2%	66.7%	48.8%	50.0%
Clarity of labs and other hands-on activities	80.6%	52.2%	76.3%	66.7%	60.0%	74.2%
Usefulness of labs or other hands-on activities	80.6%	47.8%	65.8%	66.7%	60.0%	57.6%
Adequacy of lab space and other facilities	48.4%	43.5%	47.4%	66.7%	60.0%	45.5%
Responsiveness of staff to participants	87.1%	78.3%	84.2%	83.3%	78.8%	78.8%
The overall quality of the program	96.8%	69.6%	81.6%	66.7%	76.3%	80.3%

	Subject matter taught by intended participants					
	Math		Science		Both*	
Level of current teaching assignment 5 - 8	Range of grades for participants		Range of grades for participants		Range of grades for participants	
Percent giving excellent rating	Single level	All levels	Single level	All levels	Single level	All levels
Relevance of the content to teaching assignments	75.4%	71.8%	52.6%	59.6%	56.9%	48.7%
Knowledge of staff members: content, subject matter	88.5%	97.4%	80.7%	93.0%	85.6%	82.7%
Knowledge of staff members: schools and teaching	64.8%	64.1%	35.1%	61.4%	50.3%	37.3%
Quality of printed materials used	73.0%	48.7%	45.6%	57.9%	49.1%	44.0%
Clarity of labs and other hands-on activities	68.0%	51.3%	68.4%	68.4%	68.3%	50.7%
Usefulness of labs or other hands-on activities	62.3%	56.4%	59.6%	71.9%	65.3%	44.0%
Adequacy of lab space and other facilities	55.7%	61.5%	59.6%	64.9%	64.7%	38.7%
Responsiveness of staff to participants	82.0%	82.1%	78.9%	75.4%	79.0%	79.3%
The overall quality of the program	82.8%	82.1%	75.4%	82.5%	79.0%	70.7%

	Subject matter taught by intended participants					
	Math		Science		Both*	
Level of current teaching assignment 9 - 12	Range of grades for participants		Range of grades for participants		Range of grades for participants	
Percent giving excellent rating	Single level	All levels	Single level	All levels	Single level	All levels
Relevance of the content to teaching assignments	60.0%	69.0%	63.4%	66.5%	64.2%	51.3%
Knowledge of staff members: content, subject matter	95.0%	86.2%	90.2%	88.0%	91.3%	86.6%
Knowledge of staff members: schools and teaching	50.0%	63.8%	45.9%	40.5%	34.3%	36.8%
Quality of printed materials used	58.3%	53.4%	51.9%	50.0%	53.9%	40.1%
Clarity of labs and other hands-on activities	59.2%	51.7%	54.1%	53.2%	55.1%	48.7%
Usefulness of labs or other hands-on activities	48.3%	51.7%	51.4%	51.9%	47.6%	46.1%
Adequacy of lab space and other facilities	52.5%	50.0%	65.0%	67.7%	64.2%	52.4%
Responsiveness of staff to participants	79.2%	84.5%	84.7%	79.7%	84.3%	78.8%
The overall quality of the program	77.5%	86.2%	77.6%	77.2%	76.8%	70.6%

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* Includes projects which could not be classified.

Table 10.12

Participant Ratings of TEP Project, by Teacher's Most Important Goal in Choosing TEP

Percent rating as excellent	Most important goal				
	Improve knowledge of content	Increase knowledge of applications	Enhance student interest	Develop additional teaching skills	All other responses
Relevance of the content to teaching assignments	**64.1%**	**55.5%**	59.1%	60.0%	59.1%
Knowledge of staff members: content, subject matter	**91.0%**	89.8%	**86.7%**	89.2%	87.5%
Knowledge of staff members: schools and teaching	**49.5%**	**43.2%**	46.4%	48.4%	45.7%
Quality of printed materials used	**51.9%**	**49.2%**	50.0%	49.6%	50.3%
Clarity of labs and other hands-on activities	59.1%	**50.8%**	58.8%	56.4%	**59.3%**
Usefulness of labs or other hands-on activities	52.7%	**45.3%**	54.9%	52.4%	**56.8%**
Adequacy of lab space and other facilities	**60.5%**	**53.0%**	53.2%	59.2%	57.4%
Responsiveness of staff to participants	**82.8%**	82.6%	79.2%	80.0%	**79.0%**
The overall quality of the program	**80.0%**	75.4%	73.7%	**72.8%**	76.6%

Table 10.13

Participant Ratings of TEP Project, by Selected Project Characteristics

Percent rating as excellent	Number of teacher participants			Fraction of minority participants			Subject matter taught by intended participants		
	Fewer than 40	40-99	100 or more*	Under 10%*	10% to 24.9%	25% or more	Math	Science	Both*
Relevance of the content to teaching assignments	60.3%	59.7%	60.0%	57.6%	61.4%	61.9%	69.4%	62.2%	54.9%
Knowledge of staff members: content, subject matter	89.1%	89.7%	87.5%	89.2%	88.8%	87.6%	92.8%	87.9%	87.3%
Knowledge of staff members: schools and teaching	45.5%	51.0%	44.2%	45.8%	49.8%	44.7%	61.2%	45.9%	41.3%
Quality of printed materials used	47.3%	57.2%	47.3%	45.5%	55.2%	52.5%	60.7%	51.4%	45.7%
Clarity of labs and other hands-on activities	54.2%	60.4%	58.7%	55.3%	59.4%	60.3%	61.6%	59.1%	55.8%
Usefulness of labs or other hands-on activities	53.5%	56.0%	52.3%	50.6%	56.6%	55.6%	57.0%	56.6%	51.1%
Adequacy of lab space and other facilities	60.4%	54.6%	57.1%	56.4%	56.4%	59.4%	52.1%	64.3%	55.7%
Responsiveness of staff to participants	79.8%	80.4%	80.9%	81.1%	82.8%	76.8%	81.8%	80.5%	79.9%
The overall quality of the program	76.1%	76.5%	76.6%	76.0%	79.2%	74.0%	81.6%	77.8%	73.6%

Table 10.14

Participant Ratings of TEP Project, by Selected Project Characteristics

Percent rating as excellent	Scope of recruitment					
	Local			Regional or wider*		
	Subject matter taught by intended participants			Subject matter taught by intended participants		
	Math	Science	Both*	Math	Science	Both*
Relevance of the content to teaching assignments	70.7%	66.4%	55.7%	68.5%	60.8%	54.7%
Knowledge of staff members: content, subject matter	92.1%	85.2%	82.7%	93.3%	88.9%	88.5%
Knowledge of staff members: schools and teaching	62.8%	48.3%	39.7%	60.0%	45.0%	41.7%
Quality of printed materials used	52.9%	58.4%	42.2%	66.3%	49.0%	46.6%
Clarity of labs and other hands-on activities	58.1%	69.1%	57.8%	64.1%	55.7%	55.3%
Usefulness of labs or other hands-on activities	56.5%	60.4%	58.2%	57.4%	55.2%	49.2%
Adequacy of lab space and other facilities	51.3%	62.4%	61.2%	52.6%	65.0%	54.3%
Responsiveness of staff to participants	77.5%	79.2%	80.2%	84.8%	81.0%	79.8%
The overall quality of the program	81.2%	79.2%	73.4%	81.9%	77.3%	73.7%

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* Includes projects which could not be classified.

Table 10.15

Participant Ratings of TEP Project, by Selected Project Characteristics

Percent rating as excellent	Number of teacher participants								
	Fewer than 40			40-99			100 or more*		
	Fraction of minority participants			Fraction of minority participants			Fraction of minority participants		
	Under 10%*	10% to 24.9%	25% or more	Under 10%*	10% to 24.9%	25% or more	Under 10%*	10% to 24.9%	25% or more
Relevance of the content to teaching assignments	63.5%	66.7%	46.2%	58.0%	60.4%	60.6%	51.8%	59.3%	72.7%
Knowledge of staff members: content, subject matter	91.8%	90.0%	82.1%	89.5%	92.1%	87.3%	86.7%	85.3%	91.2%
Knowledge of staff members: schools and teaching	48.0%	52.7%	32.4%	45.7%	52.9%	54.3%	43.9%	45.4%	43.3%
Quality of printed materials used	49.8%	46.0%	42.8%	49.3%	65.4%	56.1%	39.1%	51.3%	55.0%
Clarity of labs and other hands-on activities	57.4%	51.3%	49.7%	53.4%	63.8%	63.8%	54.4%	60.1%	63.4%
Usefulness of labs or other hands-on activities	55.9%	58.0%	43.4%	50.2%	54.6%	63.3%	45.9%	57.5%	55.9%
Adequacy of lab space and other facilities	64.4%	51.3%	60.7%	56.2%	55.4%	52.0%	49.0%	60.1%	65.5%
Responsiveness of staff to participants	85.1%	78.0%	69.7%	79.0%	84.6%	77.4%	78.8%	83.9%	80.7%
The overall quality of the program	80.2%	80.7%	62.1%	74.9%	78.8%	75.6%	72.8%	78.8%	79.8%

Table 10.16

Participant Ratings of TEP Project, by Selected Project Characteristics

Percent rating as excellent	Subject matter taught by intended participants								
	Math			Science			Both*		
	Fraction of minority participants			Fraction of minority participants			Fraction of minority participants		
	Under 10%*	10% to 24.9%	25% or more	Under 10%*	10% to 24.9%	25% or more	Under 10%*	10% to 24.9%	25% or more
Relevance of the content to teaching assignments	66.4%	74.0%	63.6%	62.6%	62.2%	60.8%	52.7%	47.5%	61.6%
Knowledge of staff members: content, subject matter	92.0%	93.8%	91.7%	90.0%	87.1%	82.4%	88.2%	85.4%	87.3%
Knowledge of staff members: schools and teaching	53.1%	64.3%	62.8%	48.1%	42.9%	45.9%	42.9%	41.6%	39.1%
Quality of printed materials used	46.9%	69.2%	57.9%	49.5%	51.2%	59.5%	42.9%	44.7%	49.6%
Clarity of labs and other hands-on activities	52.2%	68.7%	57.0%	57.1%	59.4%	66.2%	54.9%	49.8%	60.1%
Usefulness of labs or other hands-on activities	47.8%	63.0%	54.5%	56.1%	57.6%	55.4%	48.1%	48.9%	56.0%
Adequacy of lab space and other facilities	51.3%	53.3%	50.4%	63.7%	61.3%	75.7%	53.3%	54.8%	59.2%
Responsiveness of staff to participants	85.0%	82.8%	76.9%	81.0%	80.6%	78.4%	80.4%	84.9%	76.5%
The overall quality of the program	82.3%	85.5%	73.6%	78.2%	79.3%	71.6%	73.3%	72.6%	74.6%

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* Includes projects which could not be classified.

This was especially true for lower elementary grade math teachers. Teachers of kindergarten through fourth grade students who attended math programs aimed specifically at their grade level were near unanimous (97 percent) in assessing the overall quality of their projects as excellent. Only 70 percent of similar teachers in projects with no discernable grade level focus gave this rating. Lower grade teachers in math projects with no specific grade focus gave particularly low ratings to "Knowledge of staff members about schools and teaching." Fewer than half of the lower grade participants in such projects thought their staff were excellent on this measure, compared to 90 percent of the lower grade teachers in grade-specific math projects.

A related pattern emerges for high school teachers. When these teachers attended TEP projects specifically focussed on either math or science, they were not particularly sensitive to the grade level range of participants, often rating mixed grade programs as high as programs specifically aimed at high school teachers. However, when the program addressed both science and math teachers high school teachers generally gave higher ratings to programs which were specifically addressed to their grade level, as opposed to those with no discernable grade focus. The effects are not as strong as those for teachers of lower grade students, but are still statistically significant: 77 percent of high school teachers in single-level multi-subject projects rated the overall project quality as excellent, compared to 70 percent of high school teachers in projects with neither a specific grade focus nor specific subject content.

Teachers in upper elementary grades (5 through 8) resembled high school teachers in their preference for at least some focus on either a specific grade level or a specific content. When these teachers attended a project addressing both math and science, they uniformly gave higher ratings to grade- specific projects than to multi-grade projects.

These patterns are directly related to differences in goals between elementary, middle grade, and high school teachers. Elementary teachers place high value on goals representing instructional technique, and therefore prefer TEP projects restricted to their grade level. In programs without a grade level restriction, elementary teachers specifically object to project staff's lack of familiarity with schools and teaching issues.

High school teachers place higher value on goals relating to substantive scientific or mathematical content. These goals seem to have been equally satisfied in all projects which had either a specific science focus or a specific math focus, but not in those which either had no identifiable content area or tried to address all content areas.

10.1.3 Participant Ratings of Project Results

Patterns of participant ratings of specific results of their TEP participation resembled those of overall quality ratings (see Tables 10.17 - 10.19). Again, in general, ratings expressed a high degree of overall satisfaction: most teachers saw improvements in most of the areas covered by the survey. A principal components analysis suggested that the items in this scale fell into two broad classes of results, one relating to improved instructional skills and techniques for classroom use, and the other relating to interactions between the participant and other teachers, project staff, or local institutions.

In both of these groups of items, early elementary teachers who attended math programs focussed on their grade level tended to assign more positive ratings than early elementary teachers attending math programs with no clear grade level focus. High school science teachers likewise gave higher ratings to projects with a specific grade level focus which matched their teaching assignment. The nature and probable explanation of these patterns is essentially similar to that discussed above for general satisfaction with program quality.

Responses to some of these items are related to the size and ethnic composition of project participant groups (see Table 10.20). Overall, ratings for items on the classroom techniques factor of the scale tended to be somewhat higher for middle-sized projects (40 to 100 participants) than for those which were larger or smaller. For example, 42 percent of teachers in middle-sized projects said it was very true that their TEP participation helped them "learn to update teaching practices," compared to about 32% of those in smaller or larger projects. Similarly 61 percent of those in middle-sized projects said it was very true that TEP had "increased [their] knowledge of sources or types of teaching materials," compared to about 51 percent of those in smaller or larger projects.

Ratings for networking objectives such as remaining in contact with TEP project staff or other participants tended to be slightly lower in the largest projects (those with over 100 participants) than in small or middle-sized projects.

Projects with some minority participation (more than 10 percent of participants) tended to receive higher ratings on the classroom techniques factors than those whose participants were nearly all white and non-Hispanic. No clear pattern is evident in the relationship between networking objectives and ethnic mix.

Table 10.17

Participant Ratings of Project Results, by Participant Teaching Assignments and Award Grade Level Focus Math Projects

Subject matter taught by intended participants: Math	Current teaching assignment					
	K - 4		5 - 8		9 - 12	
	Award range of participant grades		Award range of participant grades		Award range of participant grades	
Teachers rating statement as "very true"	Single level	All levels	Single level	All levels	Single level	All levels
Classroom skills						
Improved ability to help with hands-on activities	**84%**	73%	74%	74%	**48%**	43%
Increased abilities to enhance students' interest	**84%**	62%	**68%**	67%	48%	48%
Learned about materials I used in classroom	**91%**	58%	**80%**	77%	62%	**72%**
Developed skills for improving students' thinking abilities	**78%**	73%	**77%**	74%	48%	**57%**
TEP developed materials I used in classroom	**72%**	38%	**53%**	49%	50%	50%
Would strongly recommend TEP to another teacher	**97%**	73%	**89%**	86%	86%	**98%**
Increased knowledge of teaching materials sources/types	**72%**	58%	**70%**	60%	45%	**63%**
Increased knowledge of the applications of principles	**88%**	58%	**61%**	56%	44%	**53%**
Learned to update teaching practices	**69%**	42%	**55%**	40%	30%	**35%**
Improved knowledge of science/math content	**81%**	58%	61%	**63%**	**66%**	45%
Developed ways to integrate science and math	**44%**	27%	14%	**21%**	7%	**17%**
Learned ways to motivate female, minority, or disabled	**47%**	35%	23%	**35%**	**20%**	15%
Networking						
Remained in contact with TEP project staff	**57%**	50%	39%	**44%**	27%	**57%**
Remained in contact with other participants	65%	**70%**	45%	**76%**	37%	**67%**
Gave presentations about the TEP at meetings	**61%**	40%	**73%**	40%	48%	**50%**
Served as a TEP staff member or mentor	39%	**40%**	**32%**	20%	13%	**17%**
Disseminated materials from TEP project at in-service	**78%**	50%	**83%**	40%	**65%**	57%
Established partnerships with local resources	**22%**	10%	**17%**	8%	12%	**17%**

Table 10.18

Participant Ratings of Project Results, by Participant Teaching Assignments and Award Grade Level Focus Science Projects

Subject matter taught by intended participants: Science	Current teaching assignment					
	K - 4		5 - 8		9 - 12	
	Award range of participant grades		Award range of participant grades		Award range of participant grades	
Teachers rating statement as "very true"	Single level	All levels	Single level	All levels	Single level	All levels
Classroom skills						
Improved ability to help with hands-on activities	80%	**100%**	71%	**78%**	**59%**	47%
Increased abilities to enhance students' interest	73%	**100%**	**66%**	65%	**58%**	54%
Learned about materials I used in classroom	73%	**86%**	66%	**81%**	**67%**	61%
Developed skills for improving students' thinking abilities	**60%**	57%	39%	**43%**	**40%**	30%
TEP developed materials I used in classroom	65%	**71%**	52%	**69%**	**59%**	42%
Would strongly recommend TEP to another teacher	**88%**	86%	85%	**96%**	**92%**	90%
Increased knowledge of teaching materials sources/types	78%	**86%**	53%	**70%**	49%	49%
Increased knowledge of the applications of principles	**75%**	43%	71%	**76%**	**61%**	59%
Learned to update teaching practices	**48%**	43%	27%	**43%**	**38%**	27%
Improved knowledge of science/math content	73%	**86%**	69%	**78%**	**71%**	66%
Developed ways to integrate science and math	50%	**57%**	31%	**35%**	**16%**	14%
Learned ways to motivate female, minority, or disabled	28%	**29%**	18%	**31%**	**11%**	10%
Networking						
Remained in contact with TEP project staff	29%	**50%**	**53%**	41%	**53%**	40%
Remained in contact with other participants	41%	**50%**	**44%**	38%	47%	47%
Gave presentations about the TEP at meetings	**53%**	50%	44%	**74%**	**60%**	53%
Served as a TEP staff member or mentor	**12%**		**25%**	18%	**31%**	16%
Disseminated materials from TEP project at in-service	71%	**100%**	69%	**74%**	**67%**	62%
Established partnerships with local resources	18%	**50%**	**34%**	32%	24%	**29%**

Table 10.19

Participant Ratings of Project Results, by Participant Teaching Assignments and Award Grade Level Focus Projects with Mixed or Undetermined Subject Content

Subject matter taught by intended participants: Both or unknown	Current teaching assignment					
	K - 4		5 - 8		9 - 12	
	Award range of participant grades		Award range of participant grades		Award range of participant grades	
Teachers rating statement as "very true"	Single level	All levels	Single level	All levels	Single level	All levels
Classroom skills						
Improved ability to help with hands-on activities	**77%**	76%	**78%**	54%	**48%**	46%
Increased abilities to enhance students' interest	**67%**	61%	**72%**	59%	**55%**	47%
Learned about materials I used in classroom	68%	**81%**	**79%**	63%	**64%**	63%
Developed skills for improving students' thinking abilities	**55%**	46%	**54%**	40%	31%	**36%**
TEP developed materials I used in classroom	51%	**69%**	**68%**	53%	**49%**	46%
Would strongly recommend TEP to another teacher	78%	**89%**	**95%**	84%	**90%**	84%
Increased knowledge of teaching materials sources/types	56%	**58%**	**51%**	48%	48%	**53%**
Increased knowledge of the applications of principles	57%	**68%**	**70%**	62%	**70%**	68%
Learned to update teaching practices	26%	**38%**	**38%**	23%	**32%**	27%
Improved knowledge of science/math content	64%	**74%**	71%	71%	**73%**	61%
Developed ways to integrate science and math	40%	**49%**	**42%**	25%	14%	**20%**
Learned ways to motivate female, minority, or disabled	**34%**	26%	**29%**	15%	9%	**25%**
Networking						
Remained in contact with TEP project staff	20%	**50%**	35%	**48%**	33%	**45%**
Remained in contact with other participants	38%	**50%**	**45%**	38%	**52%**	50%
Gave presentations about the TEP at meetings	40%	**43%**	50%	**57%**	44%	**52%**
Served as a TEP staff member or mentor	22%	**27%**	**32%**	31%	17%	**23%**
Disseminated materials from TEP project at in-service	**70%**	50%	**69%**	57%	49%	**52%**
Established partnerships with local resources	22%	**30%**	25%	25%	22%	**28%**

Table 10.20

Participant Ratings of Project Results, by Size and Composition of Project Participant Population

	Number of teacher participants			Fraction of minority participants		
	Fewer than 40	40-99	100 or more*	Under 10%*	10% to 24.9%	25% or more
Classroom techniques						
Improved ability to help with hands-on activities	57.7%	63.3%	59.6%	55.3%	64.8%	62.3%
Increased abilities to enhance students' interest	58.8%	62.1%	57.5%	54.1%	62.0%	63.9%
Learned about materials I used in classroom	68.8%	70.0%	65.8%	67.0%	69.6%	67.7%
Developed skills for improving students' thinking abilities	47.9%	54.5%	37.8%	38.2%	52.3%	49.9%
TEP developed materials I used in classroom	56.4%	54.8%	49.1%	53.3%	50.4%	55.1%
Would strongly recommend TEP to another teacher	88.2%	89.6%	86.9%	87.6%	88.3%	88.6%
Increased knowledge of teaching materials sources/types	51.0%	61.0%	51.3%	51.3%	57.3%	54.8%
Increased knowledge of the applications of principles	62.5%	64.5%	64.5%	61.7%	60.1%	71.5%
Learned to update teaching practices	31.9%	42.2%	31.5%	29.8%	35.2%	42.1%
Improved knowledge of science/math content	71.2%	66.0%	66.1%	68.9%	61.7%	71.9%
Developed ways to integrate science and math	21.9%	27.0%	22.6%	19.7%	18.5%	35.6%
Learned ways to motivate female, minority, or disabled	19.5%	26.2%	17.1%	13.8%	22.3%	28.7%
Networking						
Remained in contact with TEP project staff	43.2%	44.3%	35.4%	44.8%	33.6%	43.5%
Remained in contact with other participants	46.0%	47.0%	47.8%	46.0%	42.2%	53.3%
Gave presentations about the TEP at meetings	53.4%	58.9%	50.6%	55.4%	61.8%	45.6%
Served as a TEP staff member or mentor	29.0%	26.2%	24.0%	26.3%	23.4%	29.3%
Disseminated materials from TEP project at in-service	66.4%	66.8%	58.9%	59.6%	72.9%	60.1%
Established partnerships with local resources	18.8%	25.0%	26.9%	21.6%	22.8%	27.8%

10.1.4 Participant Reports of Barriers to the Use of TEP Ideas

About a third of TEP participants reported that they had run into some barriers to applying the content or methods advocated by the TEP project they attended. Teachers in projects with local recruitment -- that is, teachers whose TEP institution was based in the same community where they taught -- were slightly less likely to report such barriers than teachers recruited from beyond the local area (see Table 10.21). In addition, teachers from projects with substantial minority representation (25 percent or more) were slightly more likely to report barriers than were teachers in other projects.

Minority teachers, however, were no more likely than others to report encountering barriers to implementation (see Table 10.22). Teachers (of any ethnicity) in schools where a majority of children qualified for reduced price lunches were slightly more likely to report barriers to implementation than were teachers in schools with fewer than 25 percent of the children so situated. This is consistent with the fact that almost 60 percent of the teachers who reported a barrier mentioned lack of funds, supplies or materials as the source of the problem.

Experienced teachers were much less likely to report barriers than those who had just begun teaching. Forty two percent of teachers with five years experience or less reported at least one barrier, compared to 17 percent of those with over 35 years of experience.

10.2 TEP Principal Investigators

Eight general areas were explored in detail with respect to the TEP PIs. These included:

- Correspondence Between Project Goals and Instructional Methods;
- Correspondence Between Project Goals and the Development of Instructional Materials;
- Methods and Outcomes;
- Use of Instructional Materials;
- Correspondence of Funding Levels and Methods;
- Correspondence of Funding Levels and Ouctomes;
- Characteristics of Principal Investigators and Project Recruiting, Methods Used, and Project Achievements; and
- Characteristics of Participants

10.2.1 Correspondence Between Project Goals and Instructional Methods

TEP PIs were asked to indicate their principal project goals and objectives. Related to this, they also spelled out various organizational objectives. This first section examines the relationship between these goals and objectives and the various teaching methods employed in the projects.

The stated project goals of the PI were found to be systematically related to the instructional methods they used.[1] In general, the methods they used followed logically from the PIs' goals for their TEP projects (see Table 10.23). PIs who placed a relatively high emphasis on "improving teacher-specific knowledge of science or mathematics content" were more likely than others to use lectures often. Conversely, PIs who sought "to give participants experience with 'hands-on' activities" were less likely than others to use lectures.

PIs who placed a strong emphasis on developing "ways for teachers to enhance student interest in science or mathematics" or "skills for improving students' problem-solving or critical thinking abilities" were more likely than others to use cooperative learning groups, role playing, games, simulation, and development of student instructional materials.

When PIs placed great emphasis on developing "ways for teachers to integrate science and mathematics instruction," computer-aided instruction was a preferred method of instruction. These PIs also made significantly more use of field trips than most others.

Among PIs oriented toward helping "teachers learn how to update their teaching practices continuously to take into account new methods and course contents," cooperative learning groups and simulations were preferred methods. These PIs also spent more time than others in the development of student instructional materials.

PIs seeking "to develop participants' abilities to work with other sources (e.g., colleges, museums) of scientific and mathematics expertise" frequently made use of field trips and, correspondingly, were more likely to make use of various outside resource persons.

PIs who sought "to develop participants' abilities to lead in-service teacher training programs" made special use of peer teaching and examination of instructional materials.

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[1] *All relationships mentioned are statistically significant at the .9997 level. This level was selected to assure that the probability of mentioning one or more spurious correlations is less than 5 percent.*

Table 10.21

Barriers to Applying TEP Ideas, by Program Recruitment and Minority Participation

	Scope of recruitment		Fraction of minority participants		
	Local	Regional or wider*	Under 10%*	10% to 24.9%	25% or more
Are there barriers to applying content or methods?					
Yes	30.0%	36.8%	34.4%	31.7%	39.1%
No	70.0%	63.2%	65.6%	68.3%	60.9%
Type of barrier					
Lack of supplies / materials / funds	57.2%	60.3%	59.5%	58.9%	60.3%
Inadequate facility: Lack of appropriate space for projects	12.0%	10.4%	9.8%	11.5%	11.4%
Tight curriculum State course requirements too strict	6.0%	12.2%	12.5%	9.9%	9.1%
Scheduling: class periods too short	6.0%	3.1%	3.4%	3.1%	5.0%
Other scheduling problems	7.2%	7.9%	6.1%	7.3%	10.5%
Lack of administrative support	15.1%	14.2%	12.8%	16.7%	14.6%
Lack of support from other teachers	4.2%	6.5%	4.7%	7.3%	6.4%
Class size too large for hands on activities	4.2%	5.2%	5.7%	4.2%	4.6%
Not enough time for teacher to work on new materials	10.2%	10.9%	13.2%	9.9%	8.2%
Students not well enough prepared by previous grades	6.6%	4.4%	2.0%	4.7%	9.1%
Changed teaching responsibilities or job	6.6%	4.8%	5.1%	6.3%	4.6%
Declining enrollment	.6%	.9%	1.7%	.5%	
Disciplinary problem in classroom	1.2%	1.3%	1.0%	.5%	2.3%

* Category includes respondents for whom project data were not available

Table 10.22

Barriers to Applying TEP Ideas, by Program Recruitment and Minority Participation

	Are there barriers to applying content or methods?	
	Yes	No
What is your sex?		
Male	33.4%	66.6%
Female	35.9%	64.1%
What is your race/ethnicity?		
White, not of Hispanic origin	35.5%	64.5%
Minority	28.6%	71.4%
How many years have you been teaching?		
1 thru 5	41.7%	58.3%
6 thru 16	36.8%	63.2%
17 thru 27	34.9%	65.1%
28 thru 35	28.0%	72.0%
More than 35	16.7%	83.3%
Location		
City	33.6%	66.4%
Suburban	34.9%	65.1%
Rural	37.5%	62.5%
Students eligible for reduced price lunches		
0 to 25%	32.5%	67.5%
26% to 50%	37.9%	62.1%
51% to 75%	39.2%	60.8%
76% to 100%	39.3%	60.7%

One factor other than PI goals for the project also played a role in instructional methods used. The PIs' choices of instructional methods were influenced by the grade level taught by participants. Lectures were used often by half of the projects serving predominantly high school teachers vs. fewer than a third of the PIs serving other populations. Cooperative learning groups were rarely used in projects for high school teachers (28 percent), but were more common in others (42 to 46 percent).

10.2.2 Correspondence Between Project Goals and the Development of Instructional Materials

The association between PI goals and the development of instructional materials was also examined (see Table 10.24). Three-quarters of all projects developed instructional materials, and participants were heavily involved in 80 percent of these cases. Notably, teacher involvement was even higher among PIs who emphasized developing "skills for improving students' problem-solving or critical thinking abilities."

Project staff other than PIs were involved in half of the instances where materials were developed; when the development of effective teaching materials was explicitly included among the PI's goals, outside staff were involved in 58 percent of the projects.

Where PIs emphasized preparing teachers to lead in-service training programs and to work with other sources of science and mathematics expertise, the involvement of project staff was also significantly higher than average.

10.2.3 Methods and Outcomes

TEP PIs identified more than a dozen methods and materials used in their projects. The relationship between the methods and materials used and specific outcomes were explored (see Table 10.25). Frequent use of role playing, games, or simulation, was associated with above average satisfaction on every item measured. (One exception was that only one-third of these PIs agreed that "promises of cost-sharing by other organizations were honored," whereas over half of total respondents had agreed with this statement.)

In contrast, PIs who often used lectures had average or lower levels of satisfaction with most of the items measured. The most significant exception to this generalization is that 85 percent of lecture-dependent PIs strongly agreed that "participants increased their knowledge of science or mathematics content," compared with 81 percent of total respondents.

Table 10.23

Methods Used To Accomplish Project Objectives (Page 1)

Major Goals and Objectives	Lecture	Small group discussion	Instructor demon-strations	Participant hands-on activities	Cooperative learning groups	Computer assisted instruction	Role playing, games or simulations	Viewing films/ videos
All respondents	38.3%	45.4%	30.2%	85.7%	39.3%	8.2%	7.1%	5.6%
Improve teacher knowledge of science or mathematics	42.1%	42.7%	33.3%	84.9%	39.5%	7.4%	5.1%	4.6%
Increase teacher knowledge of science or mathematics applications	40.8%	42.2%	34.7%	84.4%	40.6%	8.9%	5.3%	3.6%
Develop ways to enhance student interest in science or mathematics	32.3%	46.8%	33.0%	89.2%	41.4%	9.0%	10.5%	4.9%
Develop ways for improving student problem solving or critical thinking abilities	29.2%	56.1%	25.2%	90.8%	51.0%	7.7%	12.5%	6.2%
To construct, investigate, document or refine effective teaching materials	34.8%	50.6%	36.0%	89.4%	42.4%	10.5%	9.7%	6.7%
To give participants experience with hands on activities	31.0%	43.9%	30.9%	92.9%	42.3%	8.8%	7.2%	2.1%
Develop ways to integrate science and mathematics instruction	36.0%	40.8%	28.9%	85.1%	43.6%	20.4%	8.7%	4.9%
Help teachers learn how to update their teaching practices continuously	31.2%	51.0%	35.8%	87.8%	50.9%	7.7%	13.4%	6.0%
To enhance each participant's sense of self competence as a teacher	31.6%	47.6%	31.8%	89.1%	44.4%	5.2%	6.6%	5.1%
Develop participants' abilities to lead local in-service training programs	36.0%	55.2%	31.2%	91.8%	45.2%	10.1%	11.5%	7.7%
Develop participants' abilities to work with other sources of scientific and mathematics expertise	18.3%	43.5%	26.7%	94.1%	47.3%	5.4%	9.1%	3.5%
Other	39.7%	51.5%	29.9%	88.0%	45.7%	4.7%	4.7%	9.1%

Table 10.23

Methods Used To Accomplish Project Objectives (Page 2)

Major Goals and Objectives	Library research	Use of resource people	Field trips	Examining instructional resources	Develop student instructional materials	Peer teaching	Other
All respondents	6.4%	33.4%	21.6%	21.2%	43.6%	27.1%	6.8%
Improve teacher knowledge of science or mathematics	5.9%	32.2%	22.7%	19.2%	40.4%	26.0%	6.9%
Increase teacher knowledge of science or mathematics applications	7.4%	36.9%	25.5%	25.5%	46.2%	27.5%	4.6%
Develop ways to enhance student interest in science or mathematics	6.2%	31.1%	23.7%	23.5%	48.4%	31.8%	7.1%
Develop ways for improving student problem solving or critical thinking abilities	7.4%	33.0%	21.0%	29.4%	52.5%	31.6%	6.6%
To construct, investigate, document or refine effective teaching materials	9.1%	37.8%	24.1%	35.3%	68.8%	31.9%	6.5%
To give participants experience with hands on activities	6.8%	33.5%	24.2%	23.6%	44.7%	29.4%	5.9%
Develop ways to integrate science and mathematics instruction	9.1%	29.0%	34.3%	17.2%	46.3%	31.6%	
Help teachers learn how to update their teaching practices continuously	9.4%	39.8%	26.4%	38.7%	53.1%	35.4%	6.8%
To enhance each participant's sense of self competence as a teacher	5.0%	33.7%	22.5%	20.1%	44.0%	28.7%	8.8%
Develop participants' abilities to lead local in-service training programs	10.9%	39.2%	20.5%	29.6%	49.9%	36.6%	7.8%
Develop participants' abilities to work with other sources of scientific and mathematics expertise	10.5%	56.1%	34.4%	18.6%	43.4%	35.0%	10.9%
Other	9.6%	33.6%	17.2%	27.4%	46.1%	29.2%	6.2%

Table 10.24

Project Objectives and the Development of Instructional Materials

Major Goals and Objectives		Individuals who were heavily involved				Were these materials reviewed for content accuracy by PIs or other		
	Instructional materials were developed as a part of this project	Teacher participants	Principal Investigator	Other project staff	Outside Specialists	All were reviewed	Some were reviewed	No
All respondents	75.1%	80.0%	38.3%	49.8%	11.5%	77.7%	16.7%	5.6%
Improve teacher knowledge of science or mathematics	75.6%	79.9%	35.8%	51.9%	6.9%	80.0%	15.7%	4.3%
Increase teacher knowledge of science or mathematics applications	78.3%	78.9%	39.4%	52.8%	14.2%	79.2%	16.0%	4.8%
Develop ways to enhance student interest in science or mathematics	78.6%	85.2%	40.4%	56.3%	14.8%	79.9%	15.1%	5.0%
Develop ways for improving student problem solving or critical thinking abilities	76.4%	87.0%	40.3%	52.7%	13.0%	80.8%	16.6%	2.5%
To construct, investigate, document or refine effective teaching materials	85.5%	83.1%	40.0%	58.3%	10.1%	87.6%	9.1%	3.3%
To give participants experience with hands on activities	75.6%	79.3%	40.9%	52.6%	10.4%	78.2%	16.2%	5.6%
Develop ways to integrate science and mathematics instruction	82.2%	74.1%	33.2%	52.1%	2.4%	76.3%	16.0%	7.7%
Help teachers learn how to update their teaching practices continuously	81.3%	82.1%	35.5%	52.0%	9.4%	79.5%	15.5%	5.0%
To enhance each participant's sense of self competence as a teacher	76.7%	83.1%	37.2%	52.4%	8.4%	78.6%	16.6%	4.8%
Develop participants' abilities to lead local in-service training programs	77.7%	85.8%	38.5%	59.8%	12.3%	78.5%	17.1%	4.4%
Develop participants' abilities to work with other sources of scientific and mathematics expertise	72.0%	85.7%	28.1%	59.8%	13.5%	65.9%	19.3%	14.8%
Other	75.5%	82.0%	37.2%	71.0%	3.5%	78.0%	13.7%	8.4%

Table 10.25

Effectiveness of Methods (Page 1)

Ways in which most participants benefited	All respondents	Lecture	Small group discussions	Instructor demonstration	Participant hands-on activities	Cooperative learning groups	Computer assisted instruction	Role playing, games, or simulations	Viewing films/videos	Library research	Use of resource people	Field Trips	Examining instructional resources
Participants increased their knowledge of science or mathematics content	81.1%	84.6%	80.0%	83.2%	81.1%	81.3%	91.2%	83.8%	83.3%	77.2%	86.2%	91.9%	78.9%
Participants increased their knowledge of science or mathematics principles	63.1%	64.8%	60.8%	63.6%	64.5%	58.1%	67.1%	80.3%	73.9%	69.1%	67.6%	74.7%	62.4%
Participants increased their knowledge of sources or types of teaching materials	58.5%	53.1%	62.8%	70.1%	59.4%	57.8%	76.3%	73.3%	78.9%	83.5%	67.1%	64.1%	83.9%
Participants used new materials or lessons in their classrooms	72.6%	64.9%	73.0%	79.4%	75.7%	79.4%	84.4%	89.4%	59.1%	84.1%	75.6%	77.5%	85.6%
Participants disseminated methods or materials from the project by leading in-service sessions in their districts	33.2%	34.5%	39.1%	37.6%	33.9%	38.5%	49.3%	50.1%	53.9%	64.3%	39.7%	31.9%	51.2%
Participants or staff members gave presentations about the project at professional meetings	37.1%	36.7%	45.0%	48.9%	36.9%	45.9%	43.1%	62.2%	66.0%	67.5%	43.5%	38.0%	62.1%
Participants served as project members or mentors in later years of the project, or in other similar projects	28.6%	23.9%	37.2%	35.6%	28.7%	33.9%	47.4%	47.9%	65.7%	44.3%	35.0%	40.9%	48.9%

Table 10.25

Effectiveness of Methods (Page 2)

Ways in which most participants benefited	All respondents	Lecture	Small group discussions	Instructor demonstration	Participant hands-on activities	Cooperative learning groups	Computer assisted instruction	Role playing, games, or simulations	Viewing films/videos	Library research	Use of resource people	Field Trips	Examining instructional resources
Participants remained in contact with each other to discuss teaching strategies or methods	34.3%	23.9%	41.6%	32.9%	35.6%	46.5%	48.4%	69.0%	34.4%	48.0%	39.9%	46.5%	42.6%
Participants remained in contact with project staff	36.9%	27.8%	46.4%	35.0%	39.6%	45.0%	43.3%	56.5%	36.3%	44.1%	43.2%	46.9%	49.4%
Participants established a working partnership with local science resources	12.0%	7.5%	16.4%	13.9%	13.2%	15.4%	27.7%	34.9%	21.9%	24.7%	17.1%	15.0%	23.3%
Participants' home school district provided adequate support for using the content or methods learned in the project	22.0%	17.5%	24.1%	25.9%	23.0%	27.0%	22.5%	32.3%	21.4%	39.1%	22.5%	20.9%	32.6%
Project increased collaboration between scientists or mathematicians and educational specialists at the host institution	27.3%	23.6%	25.0%	28.9%	28.4%	27.6%	21.0%	37.3%	20.9%	38.4%	36.8%	35.9%	25.6%
One or more journal publications resulted from the project	32.3%	27.8%	38.7%	35.9%	30.9%	35.6%	41.2%	51.1%	52.9%	61.9%	31.8%	35.4%	39.8%
Promises for cost-sharing by other organizations were honored	54.5%	55.6%	54.2%	52.8%	54.8%	58.9%	58.1%	33.6%	61.6%	62.5%	55.0%	53.6%	60.0%
Arrangements for cost-sharing led to continued collaboration after the project	23.2%	22.7%	27.1%	27.3%	25.0%	22.3%	33.9%	41.2%	36.8%	39.9%	22.7%	24.4%	25.8%

Computer-assisted instruction is another technique generally associated with high reported levels of participant benefit: in projects often using this technique, PIs reported that participants increased their knowledge of content and teaching materials. Nearly all of the PIs (86 percent) who used computer-assisted instruction frequently rated it as highly effective. They used and disseminated the new materials in the classroom, and they established and maintained long term relationships with the project, each other, and local science resources.

One-third of the PIs also reported that "arrangements for cost sharing led to continued collaboration after the project."

Frequent use of instructor demonstrations was associated with improvements in participant knowledge of sources or types of teaching materials. Perhaps in consequence of this, according to the PIs, participants in these projects were more likely than others to subsequently give presentations about the project in professional meetings.

PIs who used cooperative learning groups reported approximately average levels of participant benefits, except in one area. Forty-seven percent of these PIs said it was very true that "participants remained in contact with each other after the project to discuss teaching strategies or methods," compared with 34 percent of projects generally.

Projects whose participants often viewed films or videos, conducted library research, or examined instructional materials were much more likely than others to report favorable outcomes relating to teaching materials. They agreed that "participants increased their knowledge of sources or types of teaching materials," and that participants disseminated the materials in in-service training sessions or at professional meetings. In addition, projects using library research or emphasizing instructional materials reported that teachers were using the new materials in their classrooms (84 and 86 percent, respectively, compared with 73 percent of projects generally), and that participants had established a working partnership with a local science resource.

Use of field trips was associated with participant knowledge of both the concepts and principles of science and mathematics. In addition, PIs offering field trips were more likely than others to report that participants remained in contact with the project and with each other after the end of the formal project term.

10.2.4 Use of Instructional Materials

Instructional materials developed in collaboration with outside specialists were more likely than materials developed without outside assistance to be used by school districts for workshops (see Table 10.26). Nearly one third (31 percent) of the PIs using such specialists reported that the materials were being used for NSF-supported workshops in local school districts, and nearly half (47 percent) reported use in non-NSF workshops.

Materials which were subject to expert review (including review by the PI) were more likely than non-reviewed materials to be used at these other workshops. On the other hand, materials developed by teacher participants or by PIs were more likely to see at least one use (88 percent, and 90 percent, respectively) than were materials from projects reporting the use of outside experts (78 percent).

10.2.5 Correspondence of Funding Levels and Methods

Use of certain instructional methods was associated with the level of the project budget (see Table 10.27). Lectures were generally more likely to be used by PIs with average annual budgets of $150,000 or less (37 to 44 percent) than by PIs with higher budgets (32 to 36 percent). PIs with large budgets were more likely to use small group discussions, cooperative learning groups, and peer teaching, and were more likely to develop instructional materials as part of the project. In developing these materials, as seen in Figures 10.1 and 10.2 respectively. PIs with larger projects tended to rely less on Principal Investigators and more on other project staff. Participants in the smallest projects (those with annual budgets of $50,000 or less) were less likely than others to use new materials or lessons in their classrooms when they completed the project. In addition, they were less likely than others to lead presentations, or to remain in contact with project staff and other participants (see Figures 10.3 and 10.4).

Funding from sources other than NSF was associated with computer-assisted instruction, instructor demonstrations, and participant experience with hands on activities. In contrast, role playing, games, and simulations seemed to be preferred methods of PIs with relatively lower external budgets.

Support from the host institution was associated with use of small group discussions and cooperative learning groups, frequent use of examination of instructional materials, and participant contacts with resource people. Peer teaching was more likely to be used in situations where the host institution provided no support.

Table 10.26

Methods Which Contributed to Use of Materials

	In what ways were project materials used. . . one year after the project ended?						
	Participants using in their own classes	Participants sharing with other teachers	School districts using for workshops funded by NSF	School districts using for workshops funded by sources other than NSF	Your institution using for in-service teacher education funded by NSF	Your institution using for in-service teacher education funded by sources other than NSF	None of the above or unknown
Were instructional materials developed as part of this project?							
Yes	86.3%	82.3%	9.8%	32.3%	23.9%	44.1%	13.1%
No	88.5%	77.2%	15.9%	32.4%	15.9%	40.8%	9.5%
Individuals who were heavily involved:							
a. Teacher participants	86.6%	83.2%	8.3%	33.7%	24.6%	45.5%	12.5%
b. Principal Investigator	89.7%	84.5%	6.6%	34.9%	29.0%	46.7%	10.3%
c. Other project staff	80.8%	74.8%	8.9%	34.8%	21.0%	34.7%	17.7%
d. Outside specialists	78.0%	78.0%	31.3%	47.2%	47.4%	31.3%	22.0%
Were these materials reviewed for content accuracy by PIs or other experts in the relevant disciplines?							
All were reviewed	85.8%	82.4%	11.7%	36.4%	24.4%	46.2%	13.4%
Some were reviewed	87.1%	87.1%	4.4%	21.2%	18.7%	35.6%	12.9%
No	88.7%	66.2%		11.0%	33.6%	43.8%	11.3%

Responses are weighted to represent all awardees

Table 10.27

Effects of Funding Level on Methods (Page 1)

Methods used often	Average annual dollar funding from NSF				
	Under $50,000	$50 to $100,000	$100 to $150,000	$150 to $200,000	Over $200,000
Lecture	42.4%	36.8%	44.4%	31.9%	35.7%
Small group discussion	47.0%	35.9%	37.9%	51.9%	60.5%
Instructor demonstrations	37.2%	23.9%	26.0%	14.0%	37.3%
Participant hands-on activities	78.8%	84.7%	88.6%	81.4%	87.4%
Cooperative learning groups	32.3%	33.3%	29.2%	43.5%	50.1%
Computer assisted instruction	8.3%	5.0%	10.7%	2.1%	8.0%
Role playing, games or simulations	3.0%	7.0%	6.7%	11.8%	7.0%
Viewing films/videos	4.7%	5.5%	8.3%	2.4%	4.0%
Library research	6.9%	7.2%	2.9%	7.2%	3.6%
Use of resource people	22.7%	37.2%	27.1%	41.9%	34.1%
Field trips	14.8%	25.5%	24.0%	23.5%	12.5%
Examining instructional resources	14.4%	22.9%	21.0%	17.7%	22.7%
Development of instructional materials	44.5%	39.6%	45.2%	40.0%	37.8%
Peer teaching	18.4%	25.2%	18.9%	20.0%	42.1%
Other	5.3%	7.7%	7.8%	2.2%	11.1%
Were instructional materials developed as part of this project?	74.2%	85.5%	69.0%	100.0%	90.0%
Individuals heavily involved					
a.Teacher participants	76.2%	90.9%	64.2%	100.0%	100.0%
b.Principal Investigator	44.7%	34.9%			34.2%
c.Other project staff	46.5%	64.0%	34.5%	72.3%	43.7%
d.Outside specialists	13.6%	30.5%	17.4%		
Were these materials reviewed for content accuracy by PIs or other experts in the relevant disciplines?					
All were reviewed	77.4%	82.9%	15.5%	76.3%	89.7%
Some were reviewed	19.1%	13.1%	50.1%	23.7%	10.3%
No	7.3%	4.0%	34.5%		

Responses are weighted to represent all awardees

Table 10.27

Effects of Funding Level on Methods (Page 2)

Methods used often	Average annual dollar funding from other sources				
	Under $50,000	$50 to $100,000	$100 to $150,000	$150 to $200,000	Over $200,000
Lecture	41.6%	36.3%	10.8%	26.7%	36.2%
Small group discussion	44.1%	57.4%	54.7%	53.0%	34.4%
Instructor demonstrations	26.5%	39.9%	20.2%	26.7%	45.3%
Participant hands-on activities	87.3%	87.4%	89.2%	79.7%	100.0%
Cooperative learning groups	32.8%	42.9%	31.8%	23.7%	53.6%
Computer assisted instruction	7.1%	3.4%		26.7%	35.2%
Role playing, games or simulations	6.5%	10.4%			
Viewing films/videos	6.9%		10.8%		
Library research	7.1%	3.8%	10.8%		
Use of resource people	29.4%	48.8%	31.0%	53.0%	11.4%
Field trips	22.7%	13.4%	21.6%		10.9%
Examining instructional resources	20.0%	35.4%	11.6%	23.7%	12.1%
Development of instructional materials	41.1%	50.0%	10.0%	56.0%	35.2%
Peer teaching	22.7%	43.4%	43.9%	50.4%	66.5%
Other	8.1%		21.9%		11.2%
Were instructional materials developed as part of this project?	75.0%	85.5%	69.0%	100.0%	90.0%
Individuals heavily involved					
a.Teacher participants	77.2%	90.9%	64.2%	100.0%	100.0%
b.Principal Investigator	39.0%	34.9%			34.2%
c.Other project staff	50.8%	64.0%	34.5%	72.3%	43.7%
d.Outside specialists	12.4%	30.5%	17.4%		
Were these materials reviewed for content accuracy by PIs or other experts in the relevant disciplines?					
All were reviewed	75.5%	82.9%	15.5%	76.3%	89.7%
Some were reviewed	20.1%	13.1%	50.1%	23.7%	10.3%
No	4.3%	4.0%	34.5%		

Responses are weighted to represent all awardees

Table 10.27

Effects of Funding Level on Methods (Page 3)

Methods used often	Average annual value of in-kind contributions				
	Under $50,000	$50 to $100,000	$100 to $150,000	$150 to $200,000	Over $200,000
Lecture	42.3%	13.8%	29.9%	47.3%	51.4%
Small group discussion	37.4%	63.8%	49.7%	100.0%	52.5%
Instructor demonstrations	30.4%	19.1%	19.9%	47.3%	32.8%
Participant hands-on activities	83.0%	86.1%	86.8%	100.0%	82.9%
Cooperative learning groups	34.6%	40.7%	48.1%	52.7%	68.2%
Computer assisted instruction	5.4%	6.4%	19.9%	100.0%	
Role playing, games or simulations	4.4%	8.3%			16.1%
Viewing films/videos	5.4%				17.1%
Library research	5.4%	5.4%			
Use of resource people	30.9%	31.0%	33.4%		52.5%
Field trips	19.7%	32.1%	9.0%		17.1%
Examining instructional resources	19.2%	16.3%	19.2%		52.5%
Development of instructional materials	41.7%	38.3%	30.9%	52.7%	32.8%
Peer teaching	22.2%	19.2%	39.1%	52.7%	84.3%
Other	6.6%	11.6%			17.1%
Were instructional materials developed as part of this project?	76.9%	69.3%	81.6%	100.0%	84.3%
Individuals heavily involved					
a.Teacher participants	81.7%	81.4%	100.0%	52.7%	81.4%
b.Principal Investigator	35.4%	35.3%		100.0%	
c.Other project staff	49.8%	52.3%	54.6%	100.0%	39.1%
d.Outside specialists	12.1%	10.2%	25.2%		
Were these materials reviewed for content accuracy by PIs or other experts in the relevant disciplines?					
All were reviewed	75.5%	82.9%	15.5%	76.3%	89.7%
Some were reviewed	20.1%	13.1%	50.1%	23.7%	10.3%
No	4.3%	4.0%	34.5%		

Responses are weighted to represent all awardees

Table 10.27

Effect of Support on Methods (Page 4)

Methods used often	Support from host institution			
	None	In kind only	Dollars only	Both
Lecture	31.8%	41.3%	30.3%	35.5%
Small group discussion	35.1%	41.1%	53.8%	45.6%
Instructor demonstrations	24.8%	33.6%	32.2%	21.6%
Participant hands-on activities	83.8%	79.2%	93.3%	87.7%
Cooperative learning groups	28.3%	35.8%	30.0%	40.7%
Computer assisted instruction	12.9%	9.0%	3.3%	3.7%
Role playing, games or simulations	3.9%	7.3%	14.0%	3.8%
Viewing films/videos	2.2%	5.3%	2.9%	6.0%
Library research	4.4%	6.5%	6.2%	4.6%
Use of resource people	18.0%	35.0%	26.0%	31.1%
Field trips	19.6%	20.9%	18.2%	19.9%
Examining instructional resources	3.9%	20.0%	27.0%	21.7%
Development of student instructional materials	36.1%	43.0%	49.2%	39.8%
Peer teaching	30.9%	24.4%	26.3%	21.7%
Other	7.7%	5.0%	3.1%	9.7%
Were instructional materials developed as part of this project?				
Yes	67.3%	76.6%	79.0%	74.5%
a.Teacher participants	65.3%	81.4%	88.5%	80.2%
b.Principal Investigator	41.5%	41.3%	51.1%	30.6%
c.Other project staff	44.7%	49.4%	41.9%	53.1%
d.Outside specialists	11.8%	10.6%	14.6%	12.1%
Were these materials reviewed for content accuracy by PIs or other experts in the relevant disciplines?				
All were reviewed	68.6%	78.3%	70.4%	80.9%
Some were reviewed	18.2%	17.3%	18.7%	14.9%
No	13.2%	4.4%	10.9%	4.2%

Figure 10.1: Principal Investigator Involvement in the Development of Instructional Materials, by Funding Level

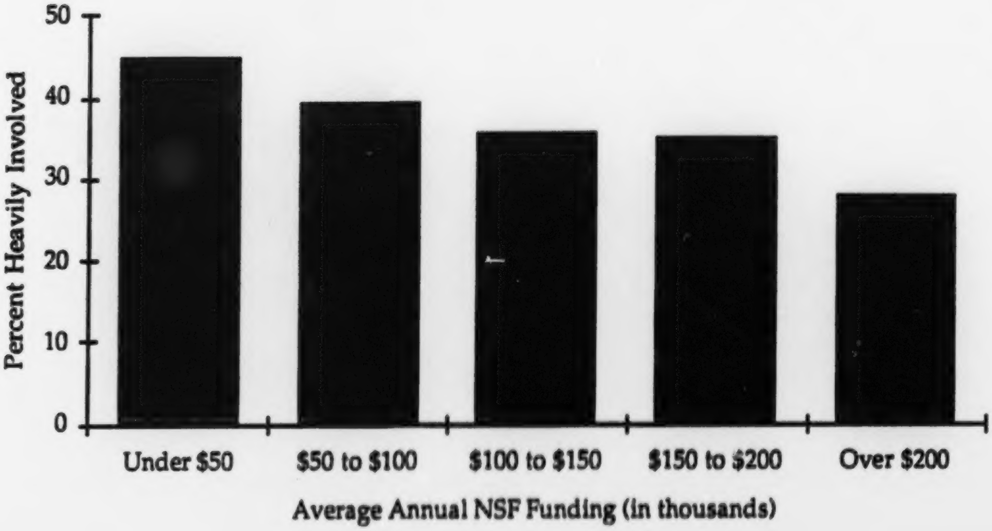


Figure 10.2: Involvement of Other Project Staff in the Development of Instructional Materials, by Funding Level

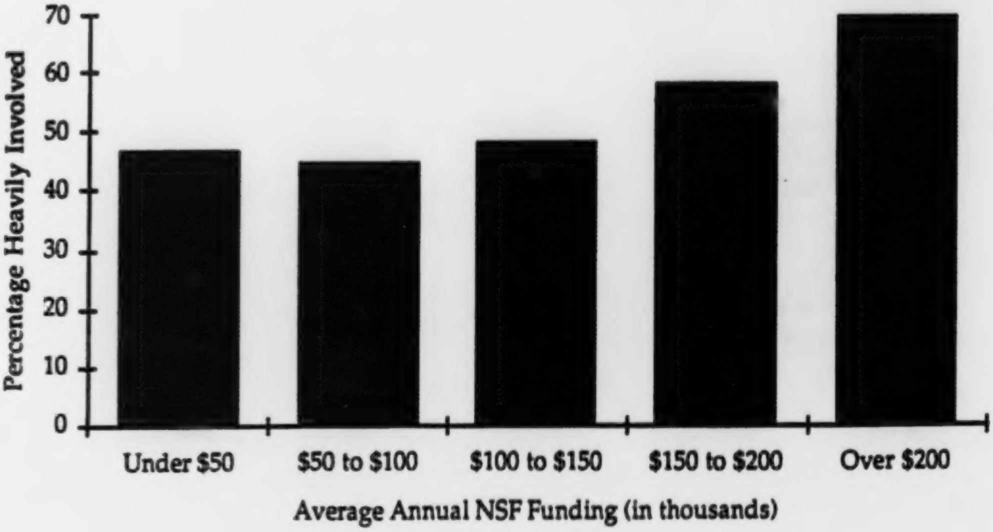


Figure 10.3: Participants Remaining in Contact with the Project Staff, by Funding Level

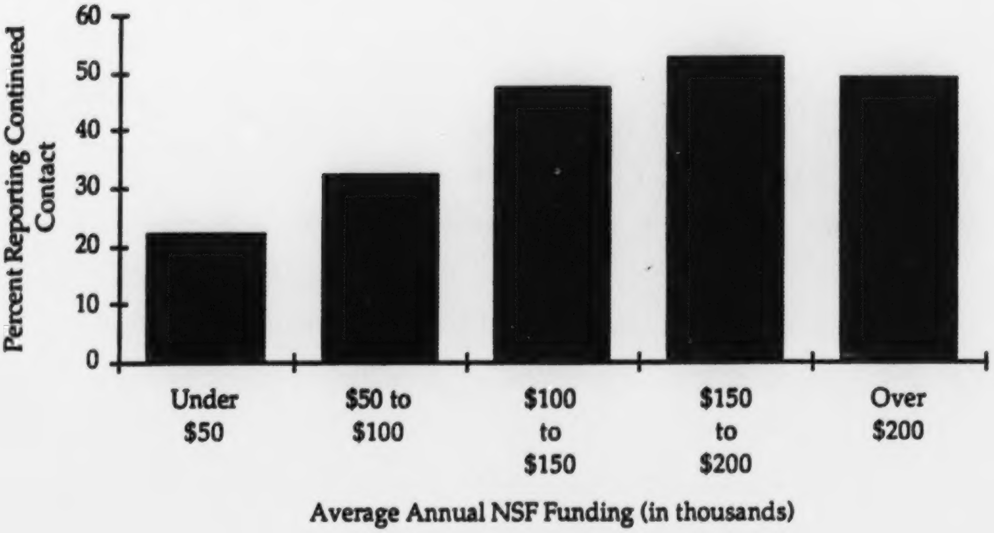
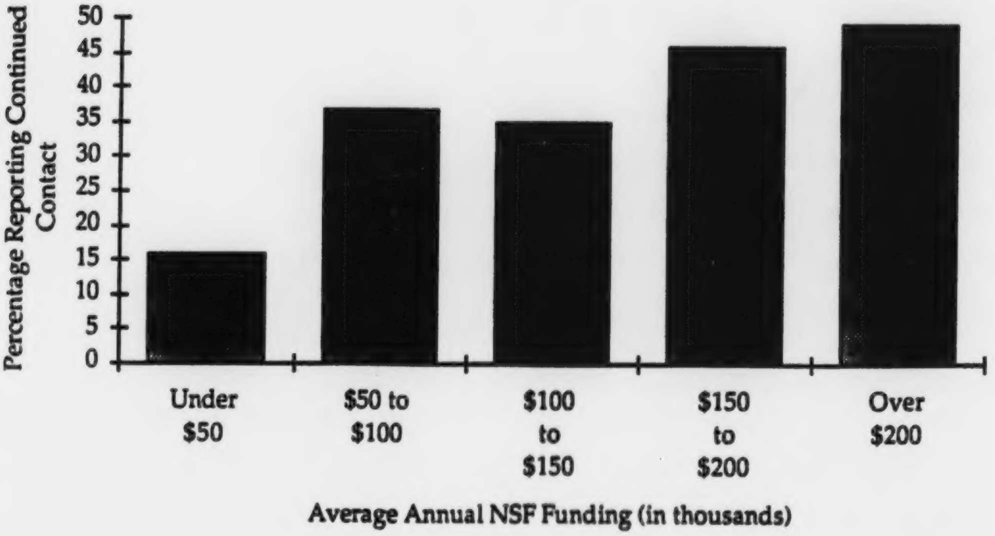


Figure 10.4: Participants Remaining in Contact with Each Other to Discuss Teaching Strategies, by Funding Level



Instructional materials were more likely to be developed in projects which received some support from their host institutions, and teacher participants were more likely to be heavily involved in the development.

10.2.6 Correspondence of Funding Levels and Outcomes

Support from the host institution was positively associated with many reported participant benefits (see Table 10.28). PIs reporting such support also reported increased participant knowledge of science or math content and increased familiarity with instructional materials.

Moreover, according to the PIs, participants in these projects were more likely to disseminate the materials at in-service training sessions and to give presentations about the project. They returned to serve as project staff members and remained in contact with project staff (but only if the support was monetary). Journal publications were also more likely to result from projects with some support from the host institution.

Principal Investigators whose projects were supported by the host institution were much more likely than others to report continued collaboration at the host institution.

10.2.7 Characteristics of Principal Investigators and Project Recruiting, Methods Used, and Project Achievements

Certain PI characteristics were associated with the impacts and outcomes of the projects as well. The Principal Investigator's ethnicity was significantly related to success in recruiting participants from among minority groups. On average, 16 percent of the participants in projects headed by white PIs were members of a minority group, but 58 percent of participants in projects with black PIs were minority group members (56 percent were black, and less than one percent were Hispanic). Hispanic project directors recruited 37 percent of their participants from minority groups (18 percent Hispanic, 7 percent black, and 12 percent from other minority groups).

The 4.5 percent of all Principal Investigators reporting a physical disability which limits a major life activity (27 persons) were much more likely to report having TEP participants who were also disabled. On average, 3.5 percent of the participants in their projects were classified as physically disabled, compared with 0.5 percent of the participants in projects with

Table 10.28

Effects of Funding Level on Outcomes (Page 1)

Ways in which most participants benefited.	Average annual funding from NSF				
	Under $50,000	$50 to $100,000	$100 to $150,000	$150 to $200,000	Over $200,000
A. Participants increased their knowledge of science or mathematics content.	83.5%	79.6%	79.4%	83.7%	87.2%
B. Participants increased their knowledge of the applications of science or mathematics principles	61.6%	66.1%	69.2%	63.4%	63.5%
C. Participants increased their knowledge of sources or types of teaching materials	62.1%	58.6%	63.1%	50.6%	63.6%
D. Participants used new materials or lessons in their classrooms	56.7%	76.4%	81.0%	81.2%	79.6%
E. Participants disseminated methods or materials from the project by leading in-service sessions in their districts	17.4%	36.3%	31.2%	44.5%	41.6%
F. Participants or staff members gave presentations about the project at professional meetings	25.8%	42.1%	32.6%	45.3%	50.5%
G. Participants served as project staff members or mentors in later years of the project, or in other similar projects	14.4%	33.3%	30.2%	42.8%	25.0%

Responses are weighted to represent all awardees

Table 10.28

Effects of Funding Level on Outcomes (Page 2)

Ways in which most participants benefited.	Average annual funding from NSF				
	Under $50,000	$50 to $100,000	$100 to $150,000	$150 to $200,000	Over $200,000
H. Participants remained in contact with each other after the project to discuss teaching strategies or methods	15.7%	37.0%	35.0%	45.9%	49.3%
I. Participants remained in contact with project staff	22.2%	32.4%	47.3%	52.6%	48.9%
J. Participant established working partnership with local science resource (e.g., college, museum, etc.)	9.2%	10.7%	13.8%	16.1%	18.2%
K. Participants' home school districts provided adequate support for using the content or methods learned in the project	20.0%	19.7%	24.9%	26.8%	31.1%
L. The project increased the collaboration between scientists or mathematicians and educational specialists at host institutions	19.8%	29.9%	29.4%	26.5%	25.4%
M. One or more journal publication resulted from the project	23.0%	30.5%	43.7%	37.4%	27.4%
N. Promises for cost-sharing by other organizations were honored	49.0%	50.7%	65.1%	55.5%	59.5%
O. Arrangements for cost sharing led to collaboration after the project	21.8%	17.5%	35.7%	20.4%	23.8%

Responses are weighted to represent all awardees

Table 10.28

Effects of Funding Levels on Outcomes (Page 3)

Ways in which most participants benefited	Average annual funding from other sources					Average annual value of in-kind contributions				
	Under $50,000	$50 to $100,000	$100 to $150,000	$150 to $200,000	Over $200,000	Under $50,000	$50 to $100,000	$100 to $150,000	$150 to $200,000	Over $200,000
Participants increased their knowledge of:										
a. - content	84.3%	67.8%	77.8%	100.0%	90.0%	80.2%	90.7%	[illegible]	[illegible]	[illegible]
b. - principles	62.4%	71.0%	90.6%	50.4%	46.1%	61.5%	74.2%	51.4%	52.7%	84.3%
c. - types of teaching materials	62.7%	77.3%	53.3%	44.0%	65.6%	58.1%	73.2%	[illegible]	[illegible]	[illegible]
d.Participants used new materials or lessons in their classrooms	72.1%	82.2%	64.6%	79.7%	88.8%	72.0%	83.7%	76.5%	100.0%	100.0%
e.Participants disseminated methods or materials at in-service sessions	36.0%	32.8%	10.8%	56.0%	43.3%	29.4%	43.7%	[illegible]	[illegible]	[illegible]
f.Participants or staff members gave presentations professional meetings	36.1%	57.1%	43.8%	100.0%	33.3%	37.0%	37.9%	52.7%	68.2%	
g.Participants served as project staff members, etc.	29.8%	30.5%	22.9%	20.3%	10.0%	25.3%	49.0%	13.2%	51.4%	
h.Participants remained in contact with each other	33.7%	55.5%	34.5%	70.7%	41.8%	30.5%	47.2%	41.0%	83.9%	
i.Participants remained in contact with project staff	37.8%	42.7%	43.9%	70.7%	52.7%	35.9%	51.5%	27.5%	66.7%	
j.Participant established working partnership withlocal science resource	13.7%	33.7%	21.0%	23.7%	32.3%	9.3%	14.5%	40.8%	66.7%	
k. Participants' home school districts provided adequate support	22.7%	20.5%	43.9%	23.7%	43.3%	21.6%	33.1%	28.0%	52.7%	32.5%
l.The project increased collaboration	29.8%	41.6%	32.4%	73.3%	20.1%	24.8%	39.5%	42.5%	32.5%	
m.One or more journal publications resulted	33.3%	48.1%	55.2%	44.0%	22.1%	27.5%	52.8%	39.8%	35.3%	
n.Promises for cost-sharing by other organizations were honored	62.3%	74.3%	89.2%	50.4%	90.0%	54.2%	68.5%	69.5%	52.7%	32.9%
o.Arrangements for cost sharing led to post-project collaboration	25.2%	56.6%	64.7%	42.7%	21.4%	37.1%	39.6%	18.5%		

Table 10.28

Effects of Funding Level on Outcomes (Page 4)

Ways in which most participants benefitted	Support from host institution			
	None	In-Kind only	Dollars only	Both
a.Participants increased their knowledge of				
a. - content	72.7%	80.6%	78.5%	66.9%
b. - principles	66.3%	62.5%	80.9%	60.6%
c. - types of teaching materials	47.1%	55.3%	75.1%	63.3%
d.Participants used new materials or lessons in their classrooms	70.3%	74.3%	81.0%	70.5%
e.Participants disseminated methods or materials at in-service sessions	25.6%	34.3%	38.4%	33.2%
f.Participants or staff members gave presentations about the project	29.2%	37.6%	39.3%	38.4%
g.Participants served as project staff members, etc.	21.1%	27.9%	22.8%	32.8%
h.Participants remained in contact with each other	31.2%	33.7%	41.5%	34.7%
i.Participants remained in contact with project staff	34.9%	32.6%	38.6%	43.1%
j.Participant established working partnership with local science resource	8.0%	11.1%	20.2%	12.5%
k. Participants' home school districts provided adequate support	23.2%	21.1%	21.0%	23.6%
l.The project increased the collaboration at the host institution	14.8%	22.1%	45.2%	33.6%
m.One or more journal publications resulted	26.2%	29.1%	45.5%	33.5%
n.Promises for cost-sharing by other organizations were honored	43.6%	47.7%	67.6%	60.9%
o.Arrangements for cost sharing led to continued collaboration after the project	14.5%	17.7%	20.6%	30.6%

PIs reporting no physical disability. Disabled PIs also tended to have slightly higher minority representation in their projects than other PIs (23 percent vs. 17 percent).

Another striking association with PI characteristics was that minority PIs were more likely to report strong benefits on items related to networking with other sources of information or support. Black PIs were twice as likely as whites (27 percent vs. 12 percent) to agree that "participants established a working partnership with a local science resource (e.g., college, museum)" and that "the project increased the collaboration between scientists and mathematicians and educational specialists at the host institution" (55 percent vs. 26 percent).

In general, characteristics of the Principal Investigator seem to have little bearing on project methods and achievements. We investigated the effects of departmental affiliation, educational background (subject and level of highest earned degree), tenure status, age, ethnicity, sex, and experience with prior TEP awards. None of these variables was systematically related to most participant outcomes.

10.2.8 PI Reports of the Characteristics of Participants

Representation of minority groups among participants appears to be related to the characteristics of the district(s) from which participants are recruited. Among those projects which drew over 90 percent of their participants from districts in the same locality as the project, 23 percent of participants were members of minority groups, while only 12 percent of participants in projects with fewer than 10 percent local participants were members of minority groups. PIs who made special efforts to recruit teachers from districts with high minority enrollments or reported specific efforts to recruit minority teachers also had a high concentration of minority participants (23 percent for both groups).

PIs reporting non-targeted recruitment methods (announcements sent to organizations and media, and personal contacts by PIs) generally served fewer minority participants than those who did not use such methods. Conversely, PIs whose staff visited schools to identify minority candidates or asked school districts to select such participants had higher than average numbers of minority participants.

Distance between teachers' home districts and the project also appeared to be a barrier to the participation of female teachers, although perhaps not for the same reasons as for minority teachers. Among the projects with few local participants, an average of 48 percent of the participants were women, while among those who recruited 90 percent or more of their participants locally, 63 percent of participants were women. Some respondents specifically mentioned conflicts between family responsibilities and the project's residence requirements as a reason for under-representation of women among project participants.

PART SIX

PI AND PARTICIPANT OBSERVATIONS ON THEIR PROJECTS AND ON THE TEP PROGRAM, AND IMPLICATIONS OF THE STUDIES FOR THE NATIONAL SCIENCE FOUNDATION

11.0 PI AND PARTICIPANT OBSERVATIONS ON THE TEP PROGRAM

Both TEP PIs and participants were provided with an opportunity to comment on various project, program and policy concerns with respect to the TEP program. These observations are summarized in this chapter. First, the incidence of response, by award year, is indicated. Then, nature of the comments is briefly summarized and various examples provided.

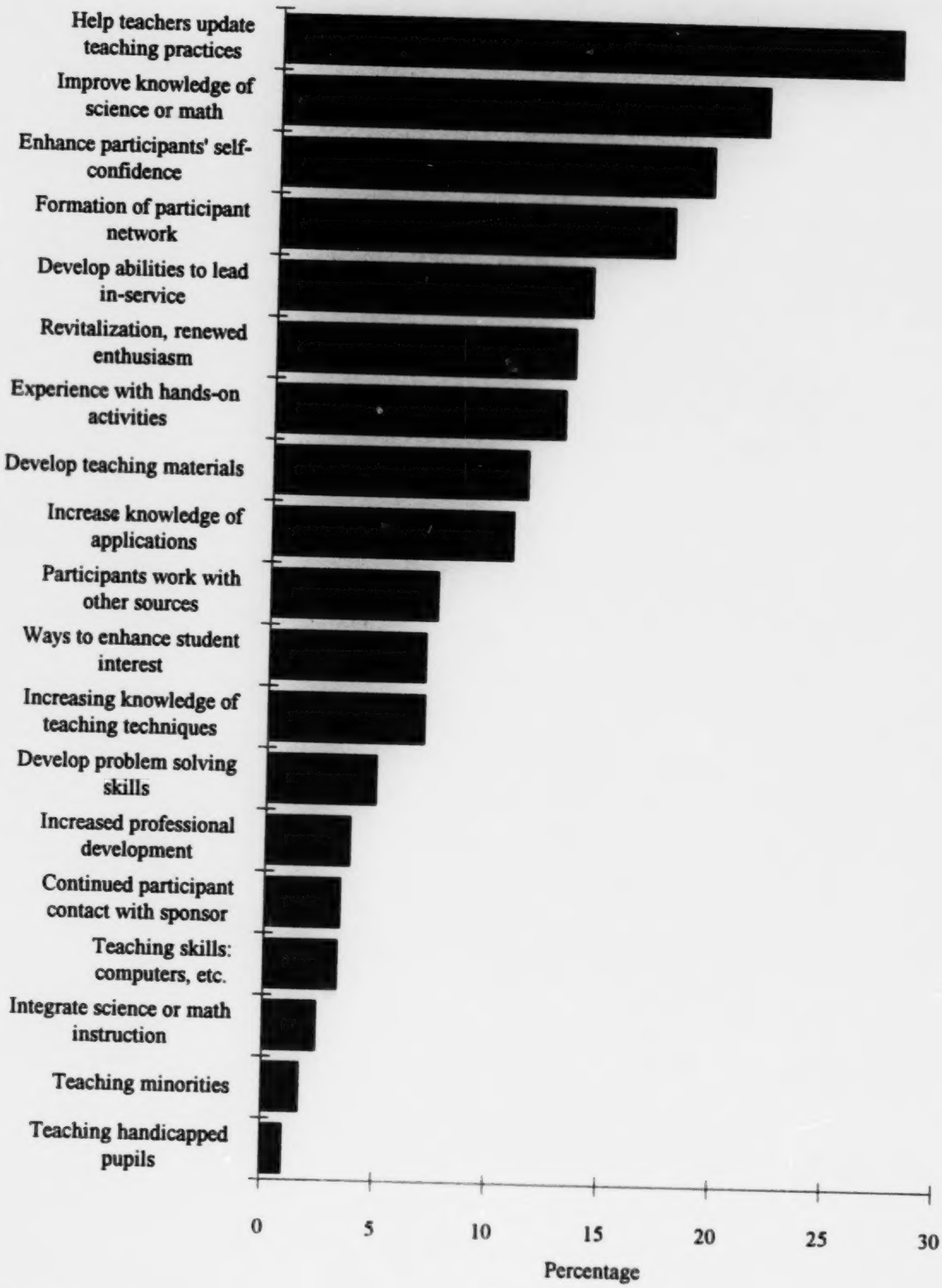
11.1 PIs Views of the Most Significant Accomplishments of the Projects

A large proportion of PIs (87.3%) responded when asked for observations on the most significant accomplishments of their projects. These responses primarily concerned helping teachers to learn to update their teaching practices continuously, improving knowledge of science and mathematics, enhancement of participants' self-confidence, and formation of participant networks. Over time, concern with helping teachers to improve their teaching practices increased, as did interest with teaching networks (see Figure 11.1).

Twenty-eight percent of responding awardees felt their project helped teachers learn to update their teaching practices on a continuous basis. One PI observed that "teachers were given innovative teaching tools and trained to lead in-service (workshops) in their home schools to introduce tools to their peers for use". A second remarked that "master teachers can be trained on specific topics to act as excellent peer trainers". A third noted the value of "getting teachers involved in projects where they practice science rather than getting it from lectures. This process makes them feel like scientists rather than educators."

Twenty-two percent mentioned the improvement of participants' knowledge regarding science and mathematics as one of the most significant accomplishments of their project. One PI observed that "participants not only learned many physics principles, they also lost their fear of physics and how to transmit that to students". Another observed that the TEP project "got non-science teachers (i.e., elementary teachers) excited about teaching science and provided

Figure 11.1 - Principal Investigators Reporting Upon Specific Significant Project Accomplishments, by Type Accomplishment



Source: PI Survey - Item 40a

Exhibit 11.1

Most Significant Project Accomplishments Cited by PIs

PART A. HELP TEACHERS LEARN TO UPDATE TEACHING PRACTICES CONTINUOUSLY (28.7%)

Showing teachers how to integrate different scientific disciplines • Setting up and testing a model for peer teaching • Able to get 30 teachers to use plants in the classroom • Presentation of new information and approaches for integration into the earth sciences and methods of instruction • Exposure of high school science teachers to new sources of satellite and airborne earth science data • Getting teachers involved in projects where they practice science rather than getting it from lectures. This process makes them feel like scientists rather than educators • Established a relationship between the college and local high school physics teachers. Made high school teachers aware of advances in modern physics and ways in which they could interest their students in science • Building a collaborative activity which everyone bought into, and which had resulted in a continuing, self-sustaining effort • Teachers were introduced to robotics concepts and how those concepts relate to math and science curricula • Demonstrating the effectiveness of the model in achieving school based change in mathematics instruction • Served as pilot program for a regional replication at several federal laboratory sites. Serves as a model for national DOE teacher research participation program • Opportunity to nurture the improved teaching effectiveness of participants and classroom implementation of investigative laboratory activities • Updating local teachers on the application of environmental and computer science • Participants in this project became master teachers in using technology to better teach mathematics • Teacher behavior changed and they are still using the materials and skills developed during the project • Provided the teachers with new ideas and understanding • Strong impact in both content and method of teaching by focusing on both at all times. Modeled what we preached • Quality of science instruction was enhanced significantly. Methods used by teachers changed drastically • Upgraded participant content and process skills • Establishment of a permanent program to enhance science and mathematics • Teacher participants continue to use the methods and content and continue to do outreach activities to others even after 3 years • Developed a core of excellent teacher presenters that are now responsible for many excellent in-service programs in the area • Master teachers can be trained on specific topics to act as excellent peer trainers • Increased participants' repertoire of instructional strategies (reduced reliance on lecture) • Teachers of American Indian students have learned how to teach culturally-relevant science and math using hands-on constructivist techniques • Significant impact on participating teachers classroom teaching techniques • Getting teachers to rethink how they teach ecology • Upgraded knowledge about content, applications, curriculum, and instruction • Teachers were given innovative teaching tools and trained to lead in-service in their home schools to introduce tools to their peers for use • Changing the mathematics classroom instructional techniques of participants to include using cooperative learning, problem solving, computers, and calculators • Smooth interfacing various scientific and pedagogic components • Teachers learned new techniques that translated into greater confidence to try new teaching methods • Participants accepted new, alternative teaching styles.

PART B. IMPROVE KNOWLEDGE OF SCIENCE OR MATH (21.8%)

Enhance knowledge and pedagogy • Exposure to what is going on in their fields • Participants spent five weeks immersed in thinking about mathematics, working one on one with a senior faculty member • Increase their awareness of a new area of science • Participants overcame their fear of physics, and

(cont.)

Exhibit 11.1 (cont.)

Most Significant Project Accomplishments Cited by PIs

PART B. IMPROVE KNOWLEDGE OF SCIENCE OR MATH (21.8%) (cont.)

became truly excited when they saw what they could do and understand • Participants not only learned many physics principles, they lost their fear of physics and how to transmit that to students • Gave teachers greatly enhanced scientific background and improved self image, confidence, and enthusiasm • Correcting misconceptions about basic subject matter in physical sciences • Provided teachers with little or no background in physical science the opportunity to learn theory and methods for teaching these topics in their classrooms • Changing teacher attitude about science and providing them with process inquiry skills • Greatly increased their knowledge and understanding of chemistry. Participants obtained the knowledge, skills, and above all confidence to conduct scientifically oriented field trips for environmental study • Got non-science teachers (i.e., elementary teachers) excited about teaching science and provided activities they could take back to their classrooms, particularly those teachers in rural, small towns and in inner-city schools • Updating the content knowledge and improving the teaching skills of secondary school teachers of science and mathematics • The project helped to create a cadre of qualified computer studies teachers in the region • All teachers learned some new mathematics • Improved their knowledge of mathematics • Able to upgrade significantly the quality of the fundamental mathematical experience of our teacher participants • Improved math understanding of teachers, college students, elementary students • Development of increased professionalism in the science teaching core • Improved the science knowledge for elementary and middle school teachers • Exposed teachers to method of inquiry into science • Content knowledge and methodology gained by participants • Information, experience, and confidence gained by classroom teachers • Over 150 teachers know more physics than ever before • Updating teachers' science knowledge, lifting their spirits • Improved the level of teacher understanding of science • Enhance teacher content background in subject area (physics) • Teachers learned about toxicity from a chemical and biological point of view • School teachers have a chance to renew their knowledge and to establish contacts with university faculty and other teachers • Subject knowledge is greatly increased • Large number of teachers that have received physics instruction, many of them for the first time • Increasing the knowledge base of participants.

PART C. ENHANCE PARTICIPANTS' SELF CONFIDENCE (19.4%)

Stimulated and interest in science teachings in local school districts • An awareness of teacher professionalism • Enhanced professional identity and rededication to teaching • Development of confidence and competence in math education • Reduced the fear and hostility that many teachers have in working with gifted students • Elementary school teachers are uncomfortable, if not petrified, teaching physics. Compatible physics course enabled teachers to teach physics with the same skill they have in other courses • Development of competence, confidence, and enthusiasm in the teaching of mathematics among participants • Teacher professionalism • Building the confidence and self-image of some good chemistry teachers who lacked faith in themselves, whose self-concept did not included being dynamic in the classroom • Changing teachers' attitude about themselves as teachers of science and building their confidence in their ability to teach science • Teacher confidence in teaching science was elevated because of increased content knowledge and a broader array of teaching strategies • Increase of commitment and self-esteem of participants • Gave teachers the knowledge and practices in geology so that they felt more confident in the classroom and in the field • Teachers had confidence to teach science • Teachers are now more enthusiastic about teaching science and feel more competent to teach science • Gave them a measure of confidence in the classroom • Provided teachers with the confidence and knowledge to incorporate

(cont.)

Exhibit 11.1 (cont.)

Most Significant Project Accomplishments Cited by PIs

PART C. ENHANCE PARTICIPANTS' SELF CONFIDENCE (19.4%) (cont.)

biotechnology laboratories in their existing biology and life science curriculum • A qualitative change in teachers. They have gained an interest, confidence, and ability to teach science in a more open, hands-on, investigatory fashion • Instilling a high degree of confidence within the participants • Having teachers realize they could teach elementary science and greatly enjoy it • Enabling a cohort of proficient K-3 teachers to become comfortable in integrating math and science throughout their curricula • Self-confidence in the teachers • The outreach, which expands teachers' vision of what teaching can be, enhances their own self-esteem, and sense of professionalism • They feel much more competent as earth science teachers • Building teacher confidence • The teachers developed a very positive attitude toward science. They couldn't wait to get back to their schools and begin teaching.

PART D. FORMATION OF PARTICIPANT NETWORK (17.7%)

Provided a network of fine teachers • Network among the participants that still exists • Giving a group of teachers a point of intellectual contact within the field in which they teach • Group interaction among HS physics teachers • Linking of teachers from several states • Brought university researchers into productive interaction with interested, accomplished middle and high school math/science teachers • Established networks for pre-college computer science teachers • Networking generated • The network of master science educators that has developed subsequent to these projects • Networking with colleagues • Teachers establishing ties where they serve as resources for one another • The contact among participants and the high-level sharing of ideas • Reached teachers in poor rural school districts that are not normally targeted • Formed a network for mathematics teachers that has provided the opportunity for continuous professional growth and development • Follow-up workshops have established that these individuals continue to build on each others' ideas and experience and their strength as a national network of astronomy educators is growing • Established a national network of teachers. • Provided a network for teachers who are very isolated and in poor schools • Developed a network of teachers in local and regional districts • Established network for pre-college computer science teachers • Empowerment of a group of middle school-junior high science teachers who developed intense close working relationships and formed networks that persisted for years • We have developed a self-sustaining network of member districts and enthusiastic alumni • The setting up of the first ever astronomy teacher agent network in the U.S. • Networking of teachers from rural and under-served groups and areas.

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activities that they could take back to their classrooms, particularly those teachers in rural, small town, and inner-city schools.

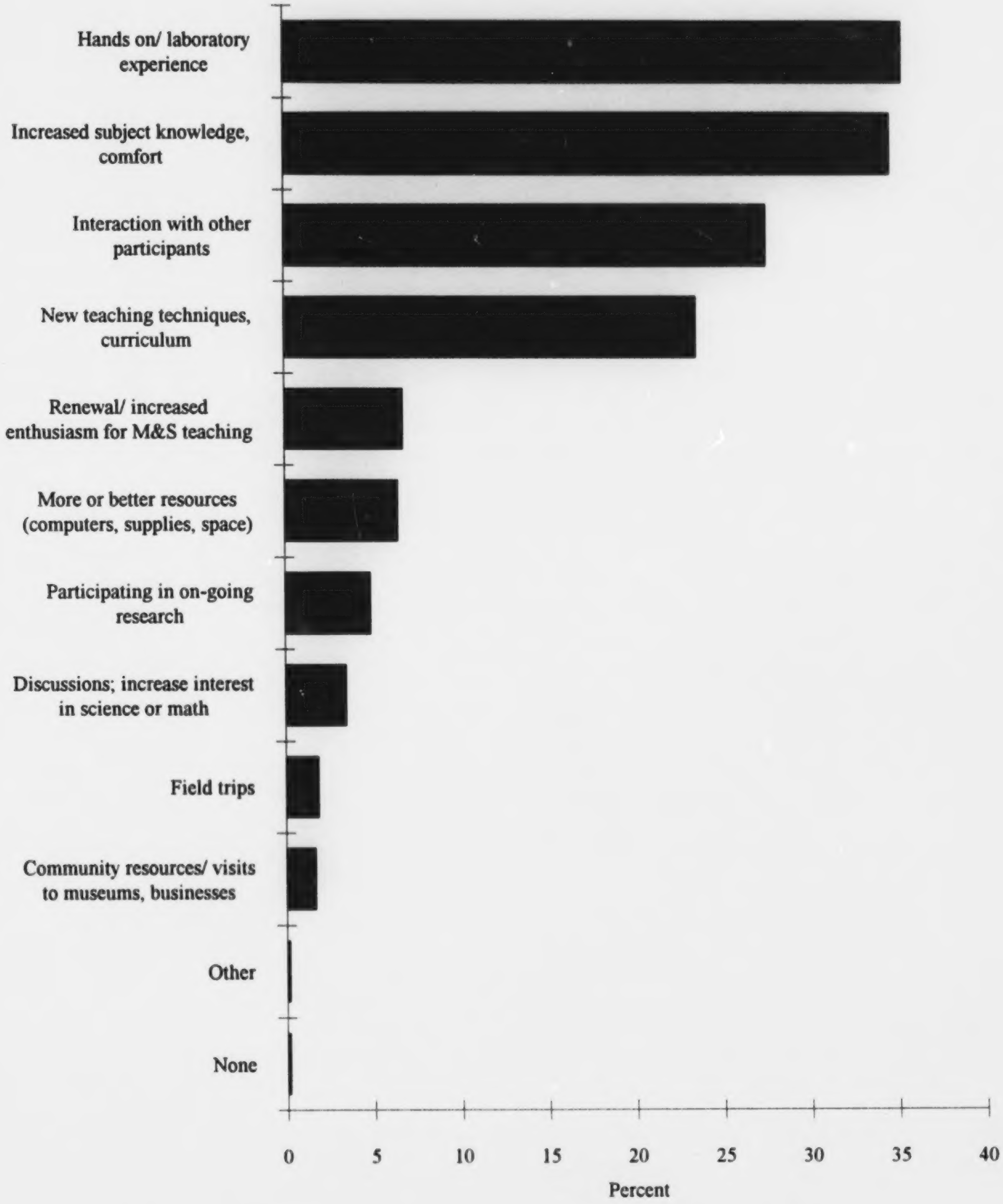
Nineteen percent cited enhanced participant self-confidence as one of the most significant accomplishments of their project. As an illustration, one PI believed that the TEP experience "reduced the fear and hostility that many teachers have in working with gifted students", while another PI observed a "qualitative change in teachers. They gained an interest, confidence, and ability to teach science in a more open, hands-on, investigatory fashion". A third PI noted that a key impact of his project was "enabling a cohort of K-3 teachers to become comfortable in integrating math and science throughout their curriculum."

Formation of participant networks was mentioned by eighteen percent of respondents. One TEP project "brought university researchers into productive interaction with interested, accomplished middle and high school math/science teachers", while another "provided a network for teachers who are very isolated and in poor schools." One PI noted that "follow-up workshops have established that these individuals continued to build on each other's ideas and experience, and their strength as a national network of astronomy educators is growing."

11.2 Participants' Views on Aspects of the TEP Project Having the Greatest Value for their Science and/or Mathematics Teaching

Participants were asked to share their observations on aspects of their projects having greatest value to themselves. In all, 75 percent of participants responded to this question. In terms of the aspects of greatest value (see Figure 11.2), the most frequently cited themes included greater laboratory experience and hands-on work (35.4%), increased subject knowledge (34.7%), interactions with other teachers (27.6%), and getting exposure to new teaching techniques, curriculum, and methods (23.6%). The responses given by participants generally corresponded to those of the PIs who also stressed the importance of participants updating their learning and building resource networks.

Figure 11.2 - Participant Views of Greatest Impacts of Projects



Source: Pariticipant Survey - Item 46a

Exhibit 11.2

Aspects of the TEP Project Having the Greatest Value for Participants

PART A. HANDS ON LABORATORY EXPERIENCE (35.0%)

The emphasis on "hands-on" math and science truly changed my method and made me a better teacher. I have greater confidence in my ability to teach and maintain discipline using "hands-on" now than before. • It greatly improved the hands-on minds on aspects of classroom education. • Being able to work in an active research lab gave me encouragement and enthusiasm about science -- hands-on activities, application, cutting-edge research, careers -- to take back to my students. • The first and major reason for my participating was the actual participation in scientific research in *all* (good/bad) of its phases. The second is actual contact with leading research scientists, getting to know them and enlisting their help, support, with education related activities. • Learning new lab techniques, developing new lab exercises, learning (via lecture) new information. • To work hands-on with colleges from across the nation. Gave us a chance to see how things are done in different parts of the country. • Learning *reliable* lab techniques in an area that I now little about. • Problem solving/critical thinking skills involved in the classroom along with group work. • Research and development projects; lab skills and math; hands-on/practical application skills. • The experience of being in the field with a knowledgeable person to instruct us. We were directed as to what to see and what significance the geologic structures had. We returned with samples and 35 mm slides which enriched our classroom and teaching techniques. • Hands-on activities with math and problem solving that put me in the position of being a learner, not a teacher. It helped me understand so well the conditions under which one learns the best and easiest. • Experiencing cooperative learning, hands-on activities, and peer teaching for myself.

PART B. INCREASE SUBJECT KNOWLEDGE AND COMFORT WITH SUBJECT (35.0%)

Confidence in my ability to facilitate science learning in students. • I believe that TEP was a turning point in my career as far as using manipulatives and developmental teaching techniques. I feel comfortable with letting children explore and draw their own conclusions and then testing those conclusions. • Enabled me to present difficult concepts and principles more clearly. • Learning some methodologies for science teaching; learning and sharing with my peers; and learning that you don't have to finish the textbook. • It opened my eyes -- I allow students to explore, experiment, evaluate, make predictions, and estimate *without* fear of failure -- to a much greater degree than I had prior to TEP. • Learning cycle -- hands-on teaching. Learning how to effectively allow kids to discover and learn. I have been able to apply this method to other areas and have integrated science and math with language. I feel I am doing a better job at teaching problem solving. • As we learned to address the children's needs -- by listening carefully to what they were saying and asking -- education took on a new meaning for all of us. We became partners in learning. The responsibility for meaningful lessons became shared. Textbooks and mimeos were left behind for exploration, discussion and reflective writing. • It helped me understand the concepts instead of having process simply memorized. • The TEP project gave me the confidence to teach in my minor field. The course improved my knowledge of chemistry and provided me with many ideas concerning hands-on lab work as well as teacher demonstrations. • I became more knowledgeable in my subject matter and gained a plethora of demonstrations which are essential to my teaching. With all of the above, I believe I have become an even more enthusiastic teacher which I hope will spur students to study science. • The seminar had a great impact in the way I perceived science and math. We were taught to motivate our students and find a way to get them to enjoy math and science. What I learned helped me develop a thirst to learn as much as I can about these subjects. • Enhanced confidence for understanding of genetics and status of current developments. • The ownership of science and math

(cont.)

Exhibit 11.2 (cont.)

Aspects of the TEP Project Having the Greatest Value for Participants

PART B. INCREASE SUBJECT KNOWLEDGE AND COMFORT WITH SUBJECT (35.0%) (cont.)

teaching -- when you feel comfortable the horizons are limitless. What a wonderful freedom to inquire, explore, question and debate these subject areas I have acquired, for the first time in my life, I feel comfortable and motivated to share, listen to and learn with my peers. • The instructors taught me to expose my students to as much as I can. Make sure that I, as the teacher, have debt in the subject matter so a discussion in the classroom will stay on track and the students will problem solve the objective through their discussion. The teacher has to ask the right questions. • To reinforce that "biotech" is doable and not as mysterious as some would have us believe.

PART C: INTERACTION WITH OTHER PARTICIPANTS (24.0%)

The interaction with other teachers while pursuing further knowledge as well as a chance to work with college professors in the field. The research was most valuable. • The exposure to talented/enthusiastic educators from across the country involved with their subject matter. • The opportunity to share ideas with other professionals who share your interests in education. This time should be of #1 priority -- too often it was incidental to less important program requirements. • The opportunity to share ideas and gain knowledge from other math teachers from all areas of the United States. • There were three things that were of great significance: 1) enthusiastic, well-informed instructors; 2) interested participants, who willingly shared their ideas and practices; and 3) a wealth of information and experiments that we had already tried that we were able to use as is. • The opportunity to meet other teachers outside my district/state. I still stay in contact with several of these teachers. As a result of that contact, I have become a *Math and Minds Eye* trainer, been invited to help develop a CPAM Visual Math NSF Grant application, attended Oregon Math Leaders with the intent of instituting a similar activity in my state. I have been exposed to new effective teaching methods which have made me a better teacher. • Peer presentation exchange in which students in the TEP formed partnerships and exchanged classes to present a "guest" lesson. I was able to visit a school in another district, attend all classes with my partner, and see how another program works. • The subject matter, content, and interaction with fellow chemistry teachers. • Sharing between teachers -- both instruction and philosophy.

PART D: NEW TEACHING TECHNIQUES (24.0%)

I saw *demonstrated* the style of teaching we were encouraged to use being used to teach us. There was no hypocrisy! The staff was very consistent in this area. • I was in a Math Dept. with burned-out, but talented, teachers, getting 2 of them to go to this with me gave new life to math at our school! They were excited to teach again and it showed. Our dept. started communicating and working together as a team (6 teachers in the dept.). Neither of them had ever used a manipulative before. We now have a cabinet filled with resources and its still spreading. We still present activities at inservices. • The opportunity to see "first-hand" the work of scientists and subsequently to relate some of these experiences to my own students. • Scientific information and teaching strategies. • It enlarged my bag of tricks of manipulatives and hands-on activities that I could use in presenting material to the students. It allowed me to have concrete experiences that were thought provoking and fair. • Learning the many new statistical techniques that have been developed in the past 15 years; continuing this study on my own

(cont.)

Exhibit 11.2 (cont.)

Aspects of the TEP Project Having the Greatest Value for Participants

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PART D: NEW TEACHING TECHNIQUES (24.0%) (cont.)

regarding applications in the workplace, SPC, JIT, and visiting major businesses in our school district to see all of this first-hand. • Demonstration of the integration of hands-on manipulatives in mathematics to a "big mathematical concept" -- a careful unfolding of the "ideas" through various types of activities which were designed to involve students thinking and doing. It required a major change for me in my role as teacher. I had to see the value of it in order to make the change; Michigan provided that. • After many years of teaching it is particularly important to revive interest and enthusiasm. The expertise and commitment of the project leaders was energizing. There was a great exchange of ideas between teachers and we all left with many new hands-on activities to use in class. • Building demonstration equipment myself that I was able to use in my classroom. Also *learning* how to use dems equipment in interesting ways to promote student interest. • The ability to see how science fiction films could be used to spark activities and questions about science. • The opportunity to be trained by the most outstanding specialists in atmospheric science provided me with excellent skills to instruct my students. • The program showed me ways to simplify concepts and to better demonstrate concepts.

With respect to Laboratory experience and hands-on work, one participant remarked that "being able to work in an active research lab gave me encouragement and enthusiasm about science -- hands-on activities, application, cutting-edge research, careers -- to take back to my students." Another remarked, "It helped me to understand so well the conditions under which one learns best and easiest."

Increased subject matter knowledge and comfort with the subject was also emphasized by many; one participant remarked that "I believe that TEP was a turning point in my career as far as using manipulatives and developmental teaching techniques." Another stated that "As we learned to address the children's needs -- by listening carefully to what they were saying and asking .. education took on a new meaning for all of us."

Interactions with other teachers was cited as important by a quarter of the participants. "The exposure to talented, enthusiastic educators from across the country involved with the subject matter" was a major benefit cited by on participant. Another commented that the "opportunity to share ideas with other professionals who share your interests in education...should be (a number) 1 priority."

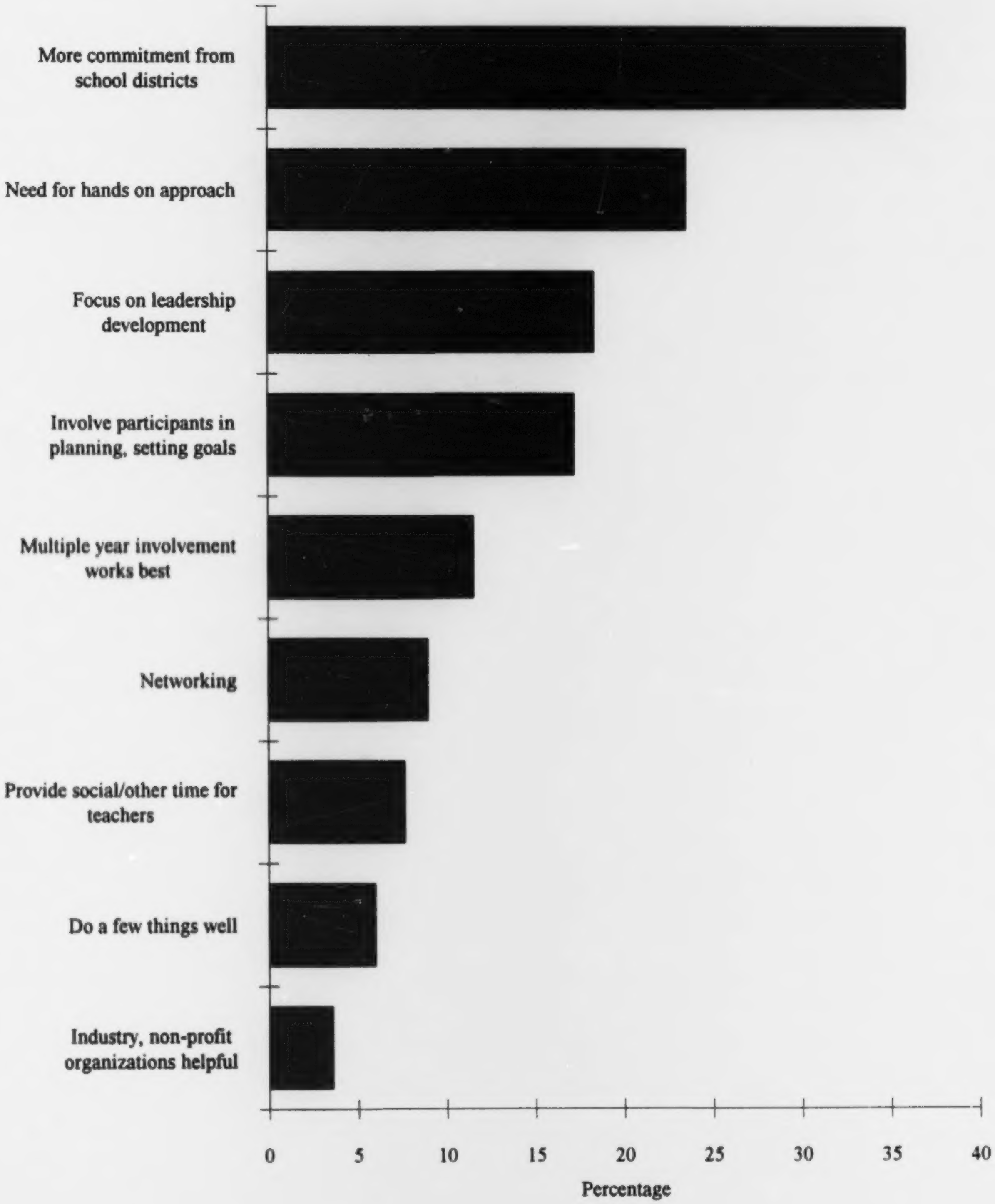
Finally, exposure to new teaching techniques, curriculum and methods was valued by participants. One noted that "the program showed me ways to simplify concepts and to better demonstrate concepts." Another noted that his staff "had never used a manipulative before. We now have a cabinet filled with resources and it's still spreading. We will present activities at inservices."

11.3 Important Lessons Learned by PIs from the TEP Projects

The majority (54.5%) of PIs had observations on the most important lessons learned in their projects. Responses to this question fell into four major categories: obtaining more commitment from the school district, the need for a "hands-on" approach to in-service training, leadership development, and planning and setting goals (see Figure 11.3). Over time, concerns with the need for school district commitment increased, and those regarding the need for a hands-on approach decreased.

The need for greater commitment and support from school districts was cited as important by 36 percent of responding awardees. One PI believed that "commitments from school districts need to be obtained in writing before the project begins", while another suggested that "financial commitment by the school of the participant" was necessary. A

Figure 11.3 - Principal Investigators Reporting Specific Lessons Learned



Source: PI Survey - Item 40b

Exhibit 11.3

Key Lessons Learned by PIs

PART A. GET MORE COMMITMENT (36.0%)

Strong commitment of support from the participant's district before acceptance into the program • Regularly had 1000 applicants for 50 positions • Rural schools are badly neglected • Need for more time, staff, and money to have a good program • Commitments from school districts need to be obtained in writing before the project begins • Administrators' promises to support their teachers' participation were not always reliable • Follow-up and school administrative involvement, commitment, is essential for any lasting impact • Frequent follow-up is essential for success. Teachers need the support • Must have whole-hearted cooperation of principals • Require cooperation by the school prior to admitting a participant • Financial commitment by the school of the participant • Be sure that school administrators are seriously committed to project goals and ideas • Cooperation between partnership schools and project is critical • Matching funds support and in-service instruction • Extremely important to secure the initial involvement and commitment of school administrators • Important that support be maintained for teachers during the academic year • Establish on-ongoing, post-funding connections and support • If principals receive the same training as teachers, they will support the program during the academic year • A great deal of time, planning, effort, and commitment is required • The need for principal commitment • Make long term commitment to participants • Support the principal is essential • Essential to get the building principal actively involved in supporting a hands on science program.

PART B. NEED FOR HANDS ON APPROACH (23.6%)

Hands-on training essential • Let the teachers do as many hands-on activities as possible • Do science instead of lecture it • Importance of residential "total absorption" setting • A mixture of lecture and hands-on experience in the most appropriate model • Need to get them in lab setting from the get-go • Provide practical activities based on good hands-on experiences • Don't spend a great period of time lecturing • Do as much hands-on as you can • HS physics teachers are hungry for how-to-do-it topics • We cannot lecture to the teachers and expect them to deliver hands on, activity-based science. Teach teachers to teach science by doing science in the classroom • Teach the material in an exciting hands-on manner • Lots of hands-on so participants become confident using science method and equipment • Abundant time for teachers to get hands-on experience with laboratory • Teaching science content in parallel with hands-on activities • Teachers need on-going, hands-on experiences • Expert lectures are not very effective hands-on, participatory,

cooperative activities are • Emphasis on hands-on and inquiry model • Need hands-on demonstrations, lab ideas and materials • Elementary teachers respond enthusiastically to instruction in conducting hands-on activities • Students respond positively to hands-on activities • Exposure to real world environment • Science teachers are not likely to try activities, experiments, or demonstrations in class unless they have tried these before.

PART C. FOCUS ON LEADERSHIP DEVELOPMENT (18.4%)

Leadership enhances their professional growth • Mentor teachers are invaluable • Teachers need school-based teacher leadership and a place to develop trusting relationships • Model the teaching strategy in your training program for teachers to emulate • Classroom teachers make excellent educational leaders • Teachers can become change agents with the support of others • Master classroom teachers are very

(cont.)

Exhibit 11.3 (cont.)

Key Lessons Learned by PIs

PART C. FOCUS ON LEADERSHIP DEVELOPMENT (18.4%) (cont.)

effective in teaching summer workshop courses • Value of outstanding physics teachers as peer instructors • Outstanding teachers who can communicate effectively to classroom teachers • Presidential awardees know science content, teaching techniques, classroom management strategies, and how to impart them to colleagues • Master teachers represent a massive storehouse of usable teaching ideas. Empower those teachers to share this resource with other less well prepared teachers.

PART D. INVOLVING PARTICIPANTS IN PLANNING OR SETTING GOALS (17.3%)

Participants have excellent ideas to share that should be implemented into the program • Planning pays off • Involve industry and teacher in the planning • Developing a feeling of ownership in ideas and activities is very important • Opportunities of participants to discuss the content of the program proved highly important • Working teachers are good advisors for curriculum projects • Involve practicing teachers in the development and delivery of the project • Establish a teacher-centered approach to collaboration • Bring teachers in early on before project starts • Projects that involve teachers in the planning and delivery of the program have a high probability for success • Work closely with school systems when developing the proposal, include them in the planning • Teachers treated as colleagues embarked on a collaborative effort to improve science and mathematics education will expend at least twice the effort that they would if treated as students • Earn the teachers' respect by treating them as professionals. Listen to their comments and understand their needs. Important to meet real needs rather than preset goals • Use the team approach.

different type of commitment was suggested by one PI who believes that "if principals receive the same training as teachers, they will support the program during the academic year".

Twenty-four percent feel the need for a hands-on approach was the most important lesson learned from their project. "Do science rather than lecture it", remarked one PI. Another observed that "high school physics teachers are hungry for how-to-do-it topics". A third PI noted that "science teachers are not likely to try activities, experiments, or demonstrations in a class unless they have tried these before".

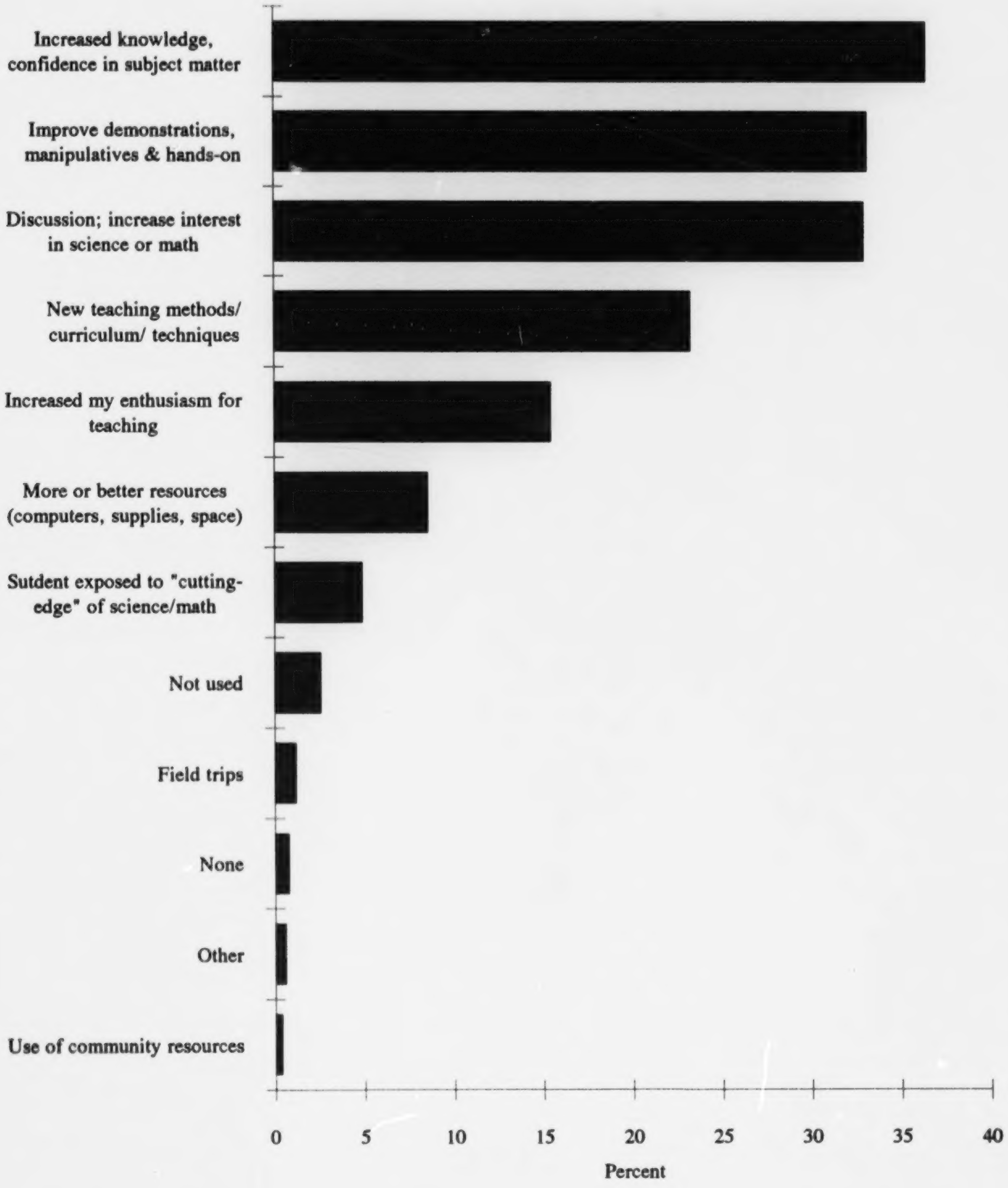
Eighteen percent reported that it was important to focus on leadership development. One believed that "master teachers represent a massive storehouse of usable teaching ideas. (We should) empower those teachers to share these resources with other, less well prepared teachers." Another PI felt that in-service trainers should "model the teaching strategy in your training program for teachers to emulate". Finally, one observed that "teachers can become change agents with the support of others".

Seventeen percent mentioned involving participants in planning or setting goals as important lessons learned from their project. One observed that "participants have excellent ideas to share that should be implemented into the program", while another observed that "developing a feeling of ownership in ideas and activities is very important". A third encouraged PIs to "listen to their comments and understand their needs. (It is) important to meet real needs rather than preset goals".

11.4 Participants' Views on the Ways in Which their Students benefitted from their Participation in the TEP Project

Three out of four participants responded when were asked to identify ways in which they believed their students may have benefitted from their participation in the TEP projects. As shown in Figure 11.4, participants reported that their students benefitted from the same things that they did, namely increased knowledge and confidence in the subject matter (36.5%), improved demonstrations and hands-on activities (33.2%), and an increased interest in science and mathematics (33.0%).

Figure 11.4 - Participants Reporting on Benefits to Their Students, by Award Cohort



Source: Participant Survey - Item 46b

Exhibit 11.4

Benefits of TEP to Students Cited by Participants

PART A. INCREASED KNOWLEDGE, CONFIDENCE IN SUBJECT MATTER (37.0%)

They have become more creative; more thoughtful; more self-confident; more respectful of one another. • The better I understand science concepts, the better job I can do in explaining in a variety of ways and on a variety of levels. • I have a wider and deeper reservoir of knowledge to draw from in diagnosing and prescribing instruction in math to reach more students in an effective manner which lasts beyond one year and algorithm memorization. • As I improve my teaching, I am better able to reach more students effectively. • My greater knowledge of how to do the inquiry approach. My deeper understanding of chemistry. I have an increased enthusiasm for science; I have a much larger repertoire of hands-on activities. • They now have a teacher who *knows* how well he is doing. Before you weren't sure about your program and qualifications. • My increased awareness of the position of a student; my increased knowledge of specific materials which made it possible for them to explore computer interfacing. • I am more willing and comfortable with experimenting with new methods. Also, I feel I became more aware of my students problems in math learning.

PART B. IMPROVED DEMONSTRATIONS, MANIPULATIVES, HANDS-ON ACTIVITIES (33.0%)

To see math in other formats and activities than just using a book worksheet, and a paper and pencil. How we can use our math thinking skills in real life situations. • The students had the benefit of "doing" in the classrooms the applications in various areas of math that I was learning. They became less fearful of math/science and began to see it as being as easy as reading. They saw the application of math/science in their daily lives. More importantly, they saw a visible person who looked like themselves who was literate in math and science. Their perception of a scientist and a mathematician changed from being overwhelmingly male and white to being female and multi-ethnic. • The have more involvement in the class because of hands-on activities. • The students use of technology has increased and students seem to be more engaged in learning activities. • Use of computers to model "real life" problems. • My exposure to new ideas and materials and my ease with using manipulatives makes my classes more fun and interesting. • The attitude and materials I received and/or developed while in the project have enabled me to teach first rate courses in computer science. My additional knowledge has also enabled me to introduce and use computer science and computers in other math classes. • More project development - involvement. • They learn more from hands-on activities and from supplemental materials instead of only their textbooks. They took an interest in life sciences and expressed their enthusiasm for biology. • My teaching includes many more concrete examples and manipulatives which address their different learning styles. They understand -- especially geometry work -- much better. They feel privileged to be in a class that works with "blocks" and chips, etc. Their attitude is much better. They work in teams betters even on "regular" math days -- lots of peer tutoring. • The hands-on experimentation, cooperative learning groups, peer tutoring and resources I can provide as their facilitator, as well as the keen interest and self motivation I see blossoming as they problem solve and discuss the issues at hand. • I think the things they learned excited them because none of the other students at the school knew what they learned. The material was fresh and different. The calculator became new to them because they learned how to use it beyond the point where they had been before. • More hands-on experience so that I teach to all three learning styles. • Better instruction; more opportunities for hands-on activities; increased teacher enthusiasm for science due to better understanding on part of teachers. • More opportunities for hands-on, participatory activities through inquiry learning and group experimentation. • My students don't read the

(cont.)

Exhibit 11.4 (cont.)

Benefits of TEP to Students Cited by Participants

PART B. IMPROVED DEMONSTRATIONS, MANIPULATIVES, HANDS-ON ACTIVITIES (33.0%) (cont.)

text and answer questions at the end of the chapter for science. I provide activities for them to experience so that they can learn from doing and discovering. • My students are excited by science. In math, we don't just drill endlessly, we use manipulatives to develop the concept and provide concrete experiences. • I have introduced material that I would not normally have used with my students. I have used ideas collected from talking to other teachers of similar subjects.

PART C. DISCUSSION, INCREASED INTEREST IN MATH AND SCIENCE (33.0%)

Students have an opportunity to see things in perspectives -- to discuss -- to assume and to theorize. • They are thrilled to come to class and willingly try or guess to make solutions to unknown concepts. • They have been given power over their own learning. • I am more open with my sharing and discussion of the issues facing society caused by science. As a result, my students see me as a person and feel they can come talk with me about a variety of problems. • More open for discussion and greater risk takers. • They have discovered that I don't give answers they have to discover the answers through guided questioning. • Self-esteem. Hearing them say they love science. Seeing relationships between math and science; students wanting to learn math so they can perform better in science. • They become a part of an open classroom climate in which *all* responses were accepted, discussed, and investigated.

PART D. NEW TEACHING METHODS/CURRICULA/TECHNIQUES (23.0%)

I have demonstrated and taught some of the lab techniques which have opened new windows of understanding. • I believe a lot of students can memorize mathematical procedures and get right answers. But by having *concrete activities* they can begin to see exactly what they are doing, why they are doing it, and how it relates to the concept. Because of the TEP project, I can do just this for them and with them. • School is more interesting for them; learning is more meaningful. They are "learning about learning," that is, they are beginning to understand their own responsibility and active part in the learning process. They are also beginning to understand and verbalize this process. • They have been exposed to latest techniques in physics experimentation. • The benefits of being part of a similar group of math teachers allowed me to be more aggressive in my changes in the classroom. I don't teach as I have been taught; I include variety and conceptual training as well as demonstration and procedure. • The classroom is now less teacher-centered and more student-centered. I ask more questions than I answer. • They have been exposed to current topics which otherwise would have been ignored. • Using teaching techniques and ideas that I learned from teachers across the U.S. • I have improved the curriculum greatly. Also, I have increased enthusiasm. The genetics course I have developed for seniors is the most popular course in the department. Since I first attended the TEP project, I have earned a Masters and am working on a Ph.D. The classes I attend (including research in 3 labs) helped me to see science as a process which I now can share with students.

(cont.)

Exhibit 11.4 (cont.)

Benefits of TEP to Students Cited by Participants

PART E. INCREASED ENTHUSIASM FOR TEACHING (16.0%)

I have been able to develop more enthusiasm for physics, better problem solving skills, and a rather overall learning environment for my students as well as the students of other teachers I have helped. • I was more excited which got them excited; students got to see how lasers, etc. worked. • I now have many new ideas and methods to use in the classroom. I have been able to bring enthusiasm to my classes and excite my students. The children usually enjoy coming into my classroom. It is a new world of discovery for them. WE work together to find information and to solve problems. • My enthusiasm and love for mathematics grew -- some mentioned that even though they did not like math, they couldn't help get caught up with my enthusiasm. The brighter students were challenged at a higher level. Pre-service teachers and student teachers knew they would never go back to teaching the way they were taught -- they loved the visual meanings presented through manipulatives. • Hopefully, the demonstrations help make science become more active to them. I believe my enthusiasm helps make the class more enjoyable, also. • My experiences made my classes more interesting and diverse than before. My students benefitted from these experiences and many have taken the time to visit the Western National Park (I still get cards from Grand Canyon). Classes were so interesting, many of them continued to an additional year of science.

More than a third of the participants indicated that their students had increased their knowledge and confidence in the subject matter since their TEP participation. One participant noted that "the better I understand science concepts, the better job I can do in explaining (them) in a variety of ways and on a variety of levels." Another wrote that "as I improve my teaching, I am better able to reach more students effectively."

One third of the respondents indicated that students had benefitted through improved demonstrations and hands-on activities. One wrote that "the attitude and materials I received and/or developed enabled me to teach first rate courses in computer science." Another noted that his students "learned more from hands-on activities and from supplemental materials instead of only their text books." A third teacher observed that "my teaching includes many more concrete examples and manipulatives which address their different learning styles. They understand -- especially geometry work -- much better. They feel privileged to be in a class that works with 'blocks' and chips, etc"

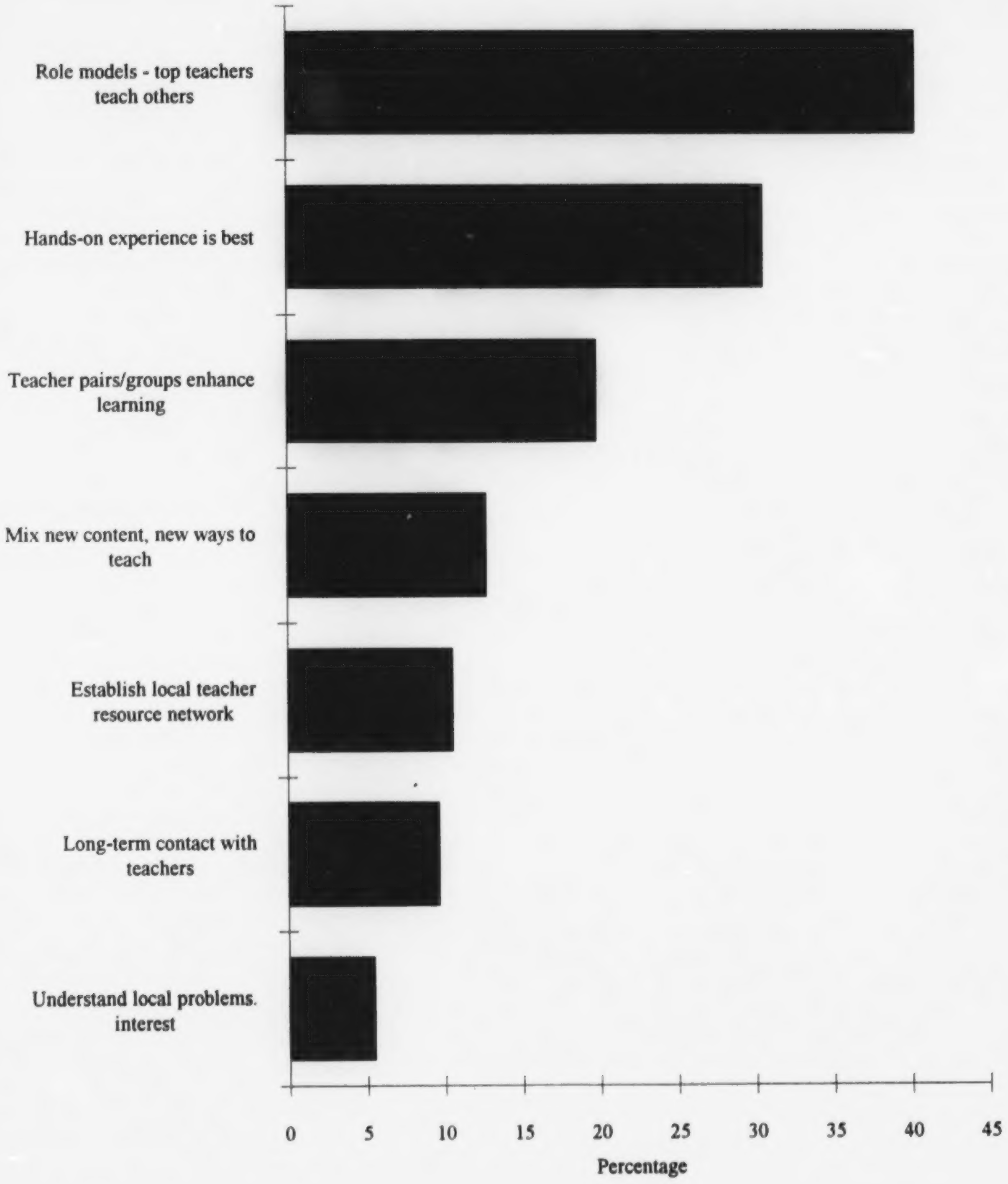
One third of the respondents also indicated that their students showed an increased interest in science and mathematics. A teacher observed that "their attitude is much better. They work in teams better on even "regular" math days -- lots of peer tutoring." Another participant stated that "they are thrilled to come to class and willingly try or guess to make solutions to unknown concepts." Another observed that students now feel "more self-esteem. Hearing them say they love science."

Similarly enthusiastic comments were made regarding new teaching methods and curricula and techniques, and about their own increased enthusiasm for teaching (See Exhibit 11.4)

11.5 Particular Models that Appear Most Promising from PIs' and Participants' Perspective for Enhancing Teachers' Skills

Over half of all PIs (52%) had observations on whether or not there is a particular "model" that holds great promise for enhancing teacher skills. The majority of the responses to the question fell into three major categories: teachers as role models, "hands-on" teaching experiences, and mixes of new content and new ways to teach (see Figure 11.5). Over time, concern with the teacher as role model increased, while hands-on teaching models declined in frequency of mention.

Figure 11.5 - Principal Investigators Reporting a Particular Model with Great Promise for Enhancing Teacher Skills



Source: PI Survey - Item 40c

Exhibit 11.5

Most Promising Models for Enhancing Teacher Skills According to PIs

PART A. TOP TEACHERS TEACH OTHERS - ROLE MODELS (40.4%)

Train master teachers on the content of the materials • Teachers teaching teachers with university faculty providing content guidance • Mentorship program is the most affective model for students and teachers I have seen in my 20 years of higher education • Dissemination via "each one reach ten" whereby individual's enthusiasm as well as technique in demonstrating and explaining is studied, copied, and improved upon. Each a master teacher, obligated to do for others what was done for them • Demonstration teaching, peer coaching, projects involving teams of teachers from a given school, organized follow-through, seminars interspersed with time to try ideas • Using master high school teachers as instructors certainly worked well here • Master teacher led development and study groups under the auspices of the universities • Use full-time, PhD faculty who can relate to pre-college teachers • Mentoring needs to be used more • No model ... to replace the motivation and enthusiasm of the project staff • The model of using teachers to teach teachers worked very well in the project • Use classroom teacher leaders to provide in-service instruction, especially those who can participate in support and follow-up activities • Project instructors should teach only their own area of expertise and communicate both knowledge and enthusiasm • Our model involves teacher participants, liaison (lead) teachers, science faculty, and science education faculty working collaboratively to develop a hands-on approach to science at three levels • Allowing skilled teachers to teach the participants is much more effective than using university staff or industrial chemists • Teachers and college faculty working together to teach other teachers • Have teachers teach teachers, they know what it's like in the classroom • Include experienced master teachers on the project staff • FAME's approach of creating lead teachers with a strong content background and the power to have continuous on-site impact on colleagues, administrators, students, parents, and higher grade student volunteers • Peer teaching • Instructors must instruct the way they want the teachers to instruct • Participants serve as resource personnel and lead workshops and other in-service activities • Program works better from bottom-up rather than top-down • A model that provides on-going, long-term, on-site contact with teachers and develops strong mentoring relationships among teachers at the same school site • Teachers teaching teachers • Master teachers who in turn hold in-service workshops for other teachers • Train master teachers to train other teachers • Peer coaching • Modeling effective teacher behavior • Use peers as head teachers • Using top teachers to teach their peers • Peer instruction ... a very effective way of teaching • The teacher as trainer of others model works well given the appropriate time and resources • Teachers as leaders - i.e. changes from the bottom-up • Combination of science content and innovative teaching techniques followed by peer teaching • The PTRAs are very effective in working with other teachers • We are committed to teachers teaching teachers • Use of more experienced teachers as "coach" for small groups of participants • One good model used by lead teachers is providing a regularly scheduled "consultant hour" in the school, when teachers can come up with specific questions and needs for classroom activities that fit their lesson plans • The model of teachers teaching teachers with presidential awardees as master/model/mentor teachers is outstanding • The C3 model is a fantastic model for creating teacher leaders. • Retiring teachers ... to get stellar new teachers up and going rapidly ... the co-teacher relationship really pays off... experience working with their mentor all year.

(cont.)

Exhibit 11.5 (cont.)

Most Promising Models for Enhancing Teacher Skills According to PIs

PART B. HANDS-ON TEACHING EXPERIENCE IS BEST (30.6%)

The "hands-on" approach is the most useful and productive • "Hands-on" involvement • Hands-on laboratory experience is best • "Hands-on involvement • Provide practical activities based on good "hands-on" experiences while modeling good teaching methodology • Don't lecture so much. Combine hands-on with lecture demos and small group discussions. Have follow-up during the school year • Hands-on experiences • Workshop instructors must model inquiry or hands-on teaching. Lecturing about hands-on activities is not worthwhile • The goal of implementing hands on science is a valid one • Direct involvement in research or technical work • A hands-on policy -that enables teachers to use their knowledge to create projects that other teachers can use • Provide practical "hands-on" experience while modeling good teaching methodology • Teachers need to experience the methods and strategies in their training that they are expected to use with students • Learning ... through presentations and hands-on experiences from engineers and scientists on "hot" topics • A design that gives participants an opportunity to be a part of the scientific problem rather than only a reader of it • Realize that science teachers, like students, learn by doing • It is imperative for projects to model excellent teaching methods, which means little lecture and lots of hands-on, cooperative, problem-solving activities • Any model will work as long as teachers have lots of time for hands-on activities and to share their own ideas • Learn by doing ... lasting acquisition of new knowledge requires experiencing the new phenomena personally • Participatory!• Hands-on, do-it-yourself. Participants do not need to sit in lecture halls • Hands-on projects for teaching middle school student concepts seems to work well • Provide generous hands-on, real-world experiences • "Hands-on, minds-on" experiences with opportunities to reflect, share results, then investigate further • Involving science and mathematics teachers in non-teaching professional work changes their self-image and the way they teach. They gain a better understanding of how science is applied in the world and they find ways to communicate this to students • Avoid lectures and use hands-on • Have hands-on experience.

PART C. TEACHER PAIRS, GROUPS FOR ENHANCING LEARNING (19.9%)

Bringing teachers who are associated with research together with academic and corporate scientists • Our partnership model works well • Continuous interaction between college and secondary science faculty is beneficial for enhancing teacher skills • The partnership model • Our model was one of having teachers sharing experiences and ideas • Structured cooperative learning • The partnership model • Peer-led study groups. Participant designed syllabus and content • The model developed in our program has been successful. It is built around a team concept • A collaborative approach emphasizing cooperative exchange of equal in seminar format with vigorous follow-up • Had teachers work in groups of 3 to prepare a revision of a laboratory or activity so that it followed the conceptual change approach • Team approach - using a team comprised of college/university faculty and high school teacher and elementary teacher for providing in-service training - has proved most effective • Support methodologies for on-going collaborative research by classroom teams.

In terms of the chief models commented upon, 40 percent of responding awardees said that top teachers teaching others is one model having great promise for enhancing teacher skills: "A mentorship program is the most effective model for students and teachers I have seen in my 20 years of higher education". One PI remarked, "train master teachers to train other teachers", while another suggested "teachers and college faculty working together to teach other teachers".

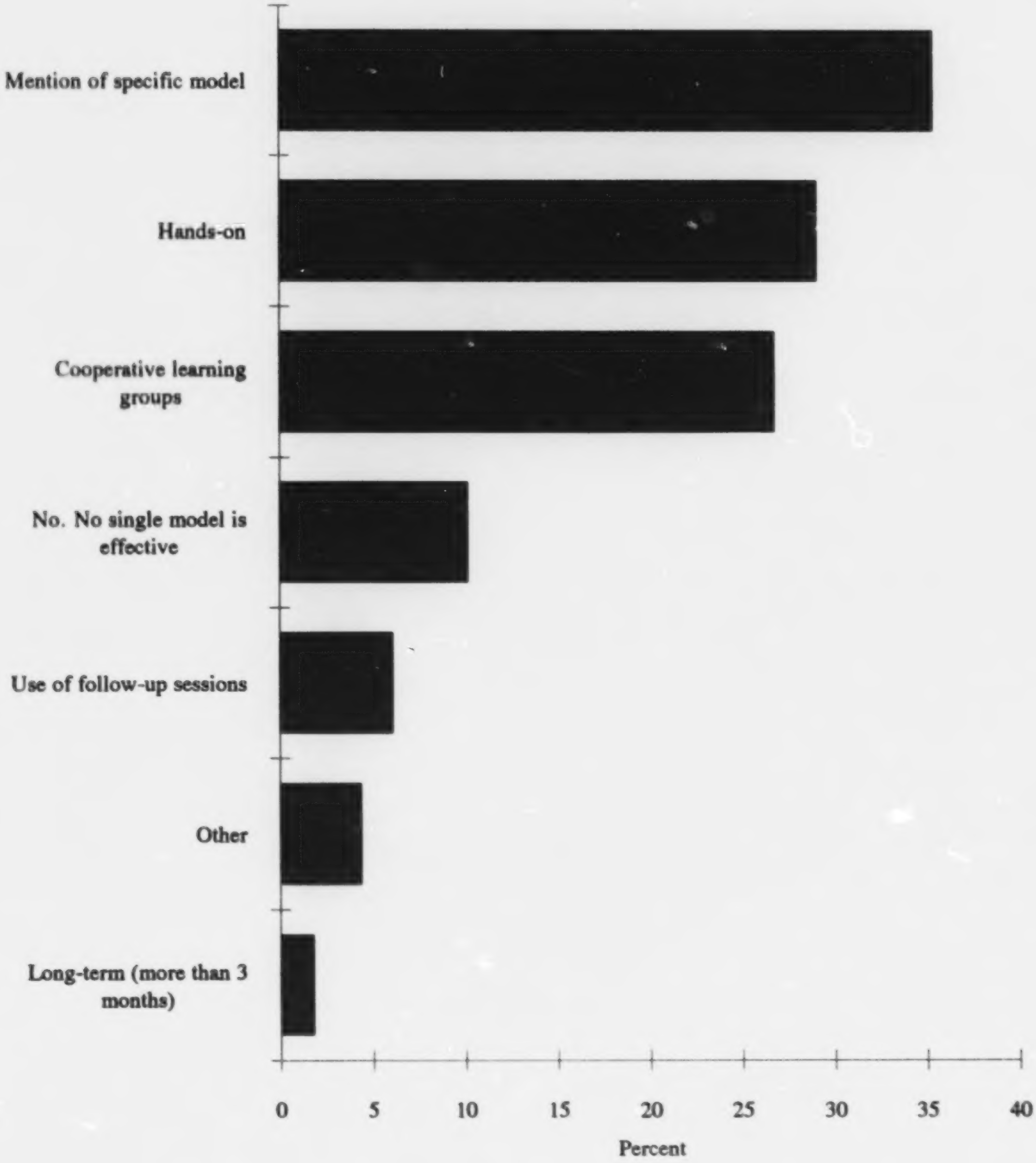
Thirty-one percent felt that hands-on experience is a key model ingredient: "The hands-on approach is the most useful and productive". A variant on this was "learning . . . through presentations and hands-on experiences from engineers and scientists on hot topics." A third PI noted that "it is imperative for projects to model excellent teaching methods, which means little lecture and lots of hands-on, cooperative, problem-solving activities". Other observations included: "Hands-on, minds-on experiences with opportunities to reflect, share results, then investigate further", "Involving science and mathematics teachers in non-teaching professional work changes their self-image and the way they teach. They gain a better understanding of how science is applied in the world and they find ways to communicate this to students."

Twenty percent mentioned teacher pairs or groups as a key model means of enhancing learning: "the team approach -- using a team comprised of college/university faculty and high school teacher and elementary teacher for providing in-service training -- has proved most effective." Other PIs suggested: "structured cooperative learning", "the partnership model", and "continuous interaction between college and secondary science faculty".

Participants were also asked for their observations on whether any particular model held great promise for enhancing teacher skills. Forty-six percent responded to this question. As seen in Figure 11.6, 35.4 percent of participants mentioned a specific model that they felt had promise while 29.1 percent cited hands-on learning and 26.8 percent cited cooperative learning groups as promising models. Some participants (10.2%) reported that there was no single model of teacher enhancement that is effective for everyone.

More than one-third of participants mentioned a specific model that they felt held great promise for enhancing teacher skills. Among these "The FAME models was excellent!", T.A.C.T.I.C.S., "ITIP", "the Connecticut B.E.S.T. model", "Project Teach", Mouse and Elephant", "Project Esteem", "TESIP", and "Wisconsin ICE" -- were each cited for particular benefits (see Exhibit 11.6).

Figure 11.6 - Participants Reporting a Particular Model with Great Promise for Enhancing Teacher Skills



Source: Participant Survey - Item 46c

Exhibit 11.6

In-Service Model with Greatest Promise Cited by Participants

PART A. SPECIFIC MODEL MENTIONED (35.0%)

The FAME model was excellent! There are many others that are also effective. The major drawback is how to continue funding for successful projects once NSF funding is gone. • ITIP - Madeline Hunter model; Project T.E.A.C.H. - techniques used to avoid conflict and keep students focused; T.A.C.T.I.C.S - thinking skills *(critical)*. • Peer enhancement was much more productive than inservice after school -- but I need guidance on how to be more effective in getting teacher participation. • I rather liked the model that his project used which was monthly, over a three year period. It kept us in touch with the participants so that we could go over what worked and how we could improve. It kept us in touch with the project directors who lent encouragement to us to try new things. It seemed to take that long for most of us to make the new activities part of our repertoire. Intense two week summer courses ______ brightly while you are there but fade by fall. When the realities of the classroom meet your new ideas you have no one to turn to for communicating and encouragement. • Intense summer workshops with stipend so teachers can afford the time to participate. • The summer workshop with required followups by participants. • These summer programs have been very effective inservice models to enhance teacher skills. It not only gives access to materials and concepts lacking in the teachers background, it also allows interaction with other teachers. We become resources for each other. • Having participated in several workshops/seminars since UMI, the most successful one has been the general model followed by Richard Minnix and Rae Carpenter at UMI. Lots of hands-on practical demos and challenging projects. The exposure to other talented educators is also vital. • Use of "Mouse & Elephant" unit in teacher inservice presentations -- deals with perimeter, area, and volume. • *Science World of Wisconsin* -- info can be obtained by contacting me directly. • The *single-topic* modules designed by the TEP project are extremely effective in my teacher-training activities. They have been well-received by the great majority of teachers I have trained. • The EMAT model is highly successful (treat people like professionals); allows teachers to share. • Yes, this intensive hands-on computer science/mathematics track that I participated in. If "many more" current "young" people/teachers could have that experience I feel our student "product" from High School would improve in quality. Part of the problem is administrators who feel threatened by technology and "old" teachers who feel the same and hold department head positions are not willing to change for the better for the staff, themselves, and for their students. • Summer math for teachers at Mt. Holyoke College uses a model that does three important things: 1) places teachers in the role of math learner, removing them from their teacher posture; 2) forces participants to examine the process of learning; and 3) models/trains participants in effective methods. • Project ESTEEM - Harvard University/Dr. Darrel Hoff. • Texas Elementary Inservice Program (TESIP). This program is part of Texas Project 2061. The program is designed around hands-on activities. • Yes, intensive staff development/ongoing. The model in this project is very effective and one that I have used in my district, and county to do staff development. • Properly funded summer institutes are the best. I've been to four in my 23 year career. I've also been to six one-day and weekend workshops. Summer institutes are far superior. They free one from the mundane chores of a family person. This added time allows one to read the articles and books given on the book lists, allow one to rub elbows with other educators to exchange ideas. • Inservice for math and science teachers is an absolute must for our nation to continue its lead role in the world. Summer institutes at nearby campuses provide the opportunity to continue the learning process while removing the burden of summer employment. As sole income for my family, I welcome more opportunities like IFSMASE in coming years. • The *Hope College* model has to be one of the best; if not *the best*! The masters degree program of the 60s and 70s were super. Any program that stresses *subject matter content* are the best. Pedagogy will take care of itself if and only if people

(cont.)

Exhibit 11.6 (cont.)

In-Service Model with Greatest Promise Cited by Participants

PART A. SPECIFIC MODEL MENTIONED (35.0%) (cont.)

have the "tools" to be creative. The *Wisconsin ICE* is excellent. • WSU does an excellent job in motivating, informing and lecturing teachers in modern trends. They do it in such a manner that is relaxing, nonthreatening and informative.

PART B. HANDS-ON (29.0%)

I felt one of the reasons this TEP project was so effective was that the participants had had experience and knew what to look for. The two instructors really had the right balance of fun work, and enthusiasm. • The chance to return to the classroom as a student and to participate in a research-oriented problem is invaluable to the science teacher. • Hands-on workshops. Teachers teaching teachers, using their own tried and proven activities. • Some lecture to provide knowledge to teachers and make them comfortable with the topics. Lots and lots of "hands-on" experiences with the topics so teachers experience them. We will do with our children what we have done and learned from. • Field work, daily interaction, followup every evening. • First providing knowledge, then guided practice followed by constructive feedback. • Launch, explore, summarize, and evaluate. • The hands-on model, actively participating rather than listening to a lecture. • The teacher must "do" the activity. Talking about it does little good in terms of getting that project implemented in the classroom. • Contacts with resource people; hands-on activities that can be used in the classroom; anything that will give teachers encouragement. • Continual followup to any new learning. Without continuing support or followup, its easy to either slide back to old methods or to not continue to grow and change. • Teacher training that involves and requires immediate use and field testing in their classes. • I like programs that put teachers in contact with subject area specialists; programs that bring teachers "up to speed" in their subject; and programs that bring good teachers together to share approaches and activities that have proven successful. • Hands-on experience in a specific subject area. • A one or two week workshop with intensive training in a specific area with accompanying instruction on how to acquire or develop materials/equipment for the course.

PART C. COOPERATIVE LEARNING GROUP (27.0%)

The best model is ineffective if administration is not cooperative and placing teaching in the best stats. • The very most is attained when we (teachers of H.S. science) have the opportunity to present and work with our peers. Too often the H.S. Ed. faculty seem pressured to impress us with their abilities. • The hands-on activity and cooperative learning groups to problem solve enhance skills across the curriculum. • Allowing teachers to discuss amongst themselves things that work and don't work and then to have labs available to try out those ideas. Hands-on is the only way we will feel comfortable enough to use what we have learned in our classrooms. • Meaningful summer institutes followed by in-classroom mentoring. Having the support of another human being is important when you are giving up everything you have always taken for granted and changing the way you facilitate learning. • Regular, interschool seminars, similar to grad school types, where instructors may: exchange ideas for student instruction; discuss problems; and enhance knowledge. • Allow time for teachers to get together and share ideas. More computer training; as this area is changing rapidly and most science teachers haven't even started. • The networking aspect of E.N.A.T; the combination of inservice courses and summer institutes have reached

(cont.)

Exhibit 11.6 (cont.)

In-Service Model with Greatest Promise Cited by Participants

PART C. COOPERATIVE LEARNING GROUP (27.0%) (cont.)

many Boston teachers. • The cooperative learning model, the team-teaching model; the Connecticut B.E.S.T. model. • Definitely cooperative learning has the most impact. I also feel setting the class in centers for teachers to explore is also very worthwhile. It's great to see the excitement spread throughout the room.

PART D. NO MODEL EFFECTIVE FOR EVERYONE (10.0%)

Not a model, but important aspects: 1) small groups -- under 20; 2) must have teacher input (don't tell the teachers what they need to know -- ask them); 3) group must be homogeneous (don't have all science teachers in one workshop -- keep it by subject matter); and 4) teachers must come away with something (materials, credit, resources, stipend, fun, etc.). • No, we must recapture the spirit of the 60s when summer institutes/academic year institutes were plentiful to the enthusiastic teacher; with stipends and family allowances. Everything I do well in the classroom has come through these workshops. Perhaps NSF should "infiltrate" colleges of education to get the level of university education courses and content courses up to NSF-sponsored levels. • No, each teacher is different with unique methods. • Our inservice programs are boring and meaningless contract obligations. • If there is anything 31 years has taught me it is this: there is *no one* model for teachers (or students) that is effective for everyone. The best situation is to have a collection of models to be applied in various situations. In my school right now, inservice should take into account the age and experience of the staff (lots of years). In service leaders have to be more than "showman" -- must have knowledge in can't be 25 -- must also have recent classroom experience; college professors are not believed because they are not in the classroom (and many have not been for years). • Not really. The main ingredient is the motivation of the teacher. He/she must be self-motivated and willing to spend a great deal of independent time studying and researching. • Model what they should do in the classroom by presenting the inservice material that way. Three 3-1/2 weeks are best. Regional projects create better support groups (more cohesion). Several teachers from school, district, or area is best. Previous attendees coming back to teach in project is not as good as it sounds on paper. Causes competition to be "noticed" by college staff between participants. Brings out aggressiveness, etc.; creates hard feelings and super stars.

Just under 30 percent cited hands-on learning as a key generic model for instruction. One remarked that "the chance to return to the classroom as a student and to participate in a research-oriented problem is invaluable to the science teacher." Another observed that "a teacher must 'do' the activity. Talking about it does little good in terms of getting that project implemented in the classroom."

Just over one-quarter of respondents cited cooperative learning groups as a promising model. "The very most is attained when we (teachers of H.S. science) have the opportunity to present and work with our peers" stated one participant. "Having the support of another human being is important when you are giving up everything you have always taken for granted and changing the way you facilitate learning" observed another.

It is noteworthy, however, that 10 percent of the respondents believed that there was no effective model for everyone. One stated that "each teacher is different with unique methods" Another observed that "if there is anything that 31 years of teaching has taught me, it is this: there is *no one* model for teachers (or students) that works for everyone."

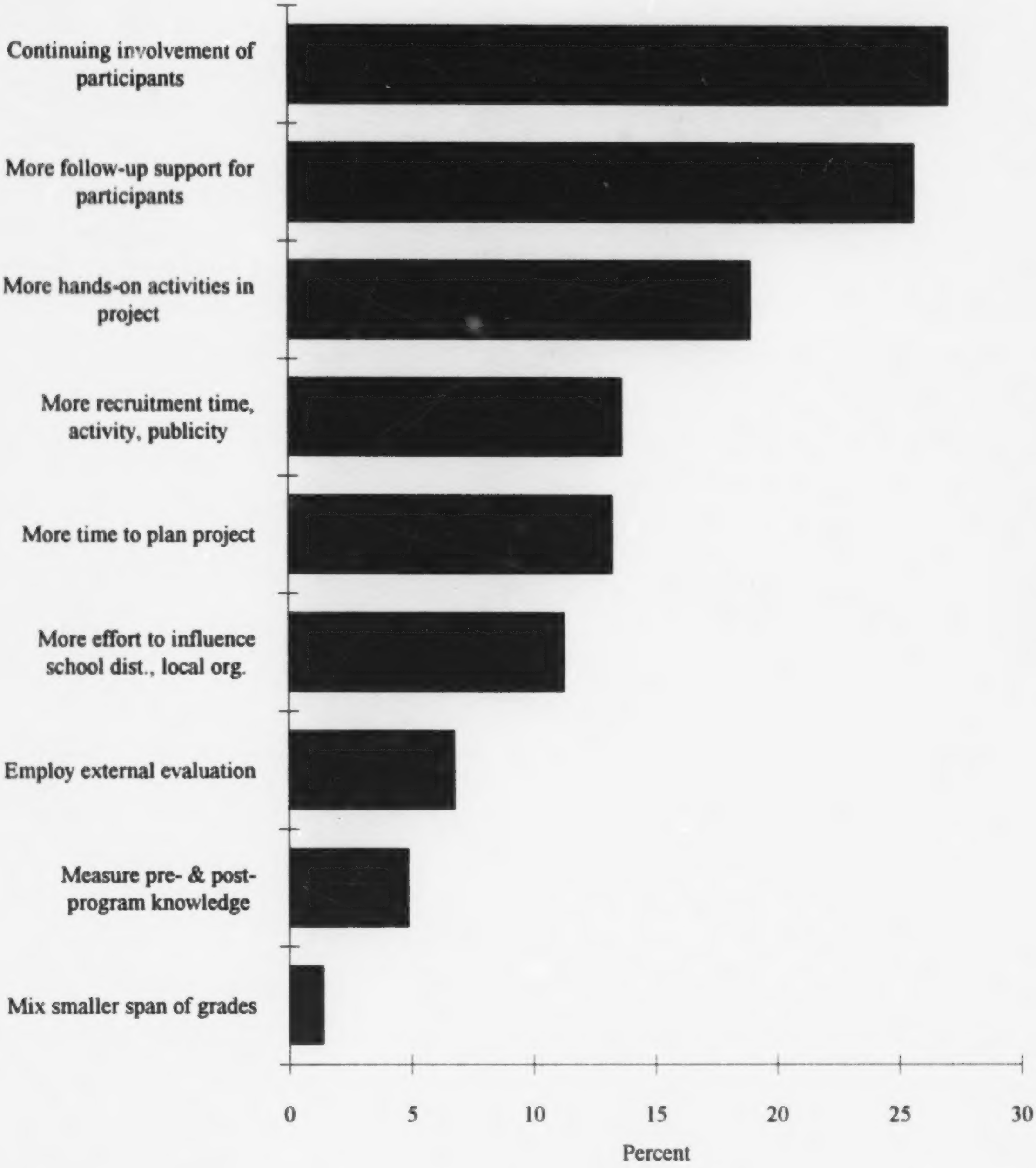
11.6 Most Important Changes that PIs and Participants would Make in the Operation of their Projects.

Many PIs (46.3%) had observations on important changes they would make in a future in-service project. Responses to this question fell into three major categories. The most frequently made comments concerned continuing involvement of participants, more follow-up support to participants, and more hands-on project activities (see Figure 11.7). Over time, while the overall frequency was lower, comments on greater efforts to involve the school district increased significantly.

Twenty-seven percent felt the continuing involvement of participants was the most important change that they would make. As an illustration, one PI stated that he would "run (the TEP project) over a longer period of time than one summer. The teachers need ideas reinforced over several years." Another focused on the length of the project within the year, "increas(ing) the project from 3 to 4 weeks per summer." A third PI suggested "get(ting) a newsletter out, started with past participants".

Twenty-six percent mentioned the need for more follow-up with participants. One PI recommended follow-up that would "extend . . . for three years or more", while others focused on additional sessions over time. One suggested that NSF should "get itself more

Figure 11.7 - Principal Investigators Reporting Important Changes They Would Make in Their TEP Projects



Source: PI Survey - Item 40d

Exhibit 11.7

Most Important Changes that PIs Would be Made to Improve Projects Operations

PART A. CONTINUING INVOLVEMENT OF PARTICIPANTS (27.1%)

I can hardly remember this project. Would try harder to maintain long term contacts with participants • Project was too short to establish long-term collaborations • Run it over a longer period of time than one summer. The teachers need ideas reinforced over several years • Some teachers should return for a second or third year to act as mentor teachers • Three year projects • Wish we could get a regular newsletter off the ground to past participants • Make it a two-year program at the outset. Include more poster sessions and events during the year to make teachers keep progressing • Extend the time period to allow a slower pace • Allow even more time for teachers to share ideas • Increase the project from 3 to 4 weeks per summer • Bring more past participants back years 2 and 3 • Get a newsletter started with past participants • More time, two years minimum • Lengthen the time of the institute, include school year component • Additional release time for faculty to support teachers after they return to their classroom. Developing longer follow-up activities with participants. Providing mandatory release time for teachers during academic year following the summer institute.

PART B. MORE FOLLOW-UP SUPPORT OF PARTICIPANTS (25.7%)

Get NSF to get itself more organized to provide better communication with PI's • Institutional follow-up could be improved • More sessions for follow-up would be good • More follow-up with previous participants • Would like to be able to follow students of these teachers before and after the institute as they go into high school and college • Better communications and follow-up • More extensive follow-up of participants • More follow-up help back at home schools • More follow-up, ensuing school year as well as the following summers • Stronger accountability procedures and monitoring of teacher implementation of project • Lines of communication • More thorough follow-up • Extend the follow-up to cover three or more years •

PART C. MORE HANDS-ON ACTIVITIES IN PROJECT (19.0%)

Much more emphasis on using laboratory experiments as a means of exploration • Integrate development of a science lesson unit to implement workshop, interactive session activities • Field trips do the best for teacher enhancement in earth science • Add on amusement park physics activity and enlarge upon demos which could be made into mini-labs or take-home labs for data collection and analysis • Activities using teacher constructed apparatus and classroom data taking exercise • Many more hands-on activities • More hands on time • Emphasis on personalized slide preparation from the field trips • Plan more time for the participant to interact in unstructured activities • More hands-on activity for participants • More support for students in our lab classes • More hands-on labs and more small group work.

organized to provide better communications with PIs." Another noted that he would like "to be able to follow students of these teachers before and after the institute as they go into high school and college."

Nineteen percent felt that incorporating more hands-on activities into the project was an important change they would make should they run another project. A variety of mechanisms were suggested, including "more emphasis on use of laboratory experiments", "field trips", "amusement park physics", and "take-home labs for data collection."

Participants were also asked to name the most important changes that they would make to improve TEP projects. As seen in Figure 11.8, the most common response cited by participants was that they would not make any changes in the way that TEP program were run. Participants that reported changes cited unspecified changes in course content (17.0%), increased input and time with participants (9.7%), and more field trips and hands-on experience (9.1%) most often. The most important change cited by PIs, pursuing greater continuing involvement with participants, was cited by 8.7 percent of participants.

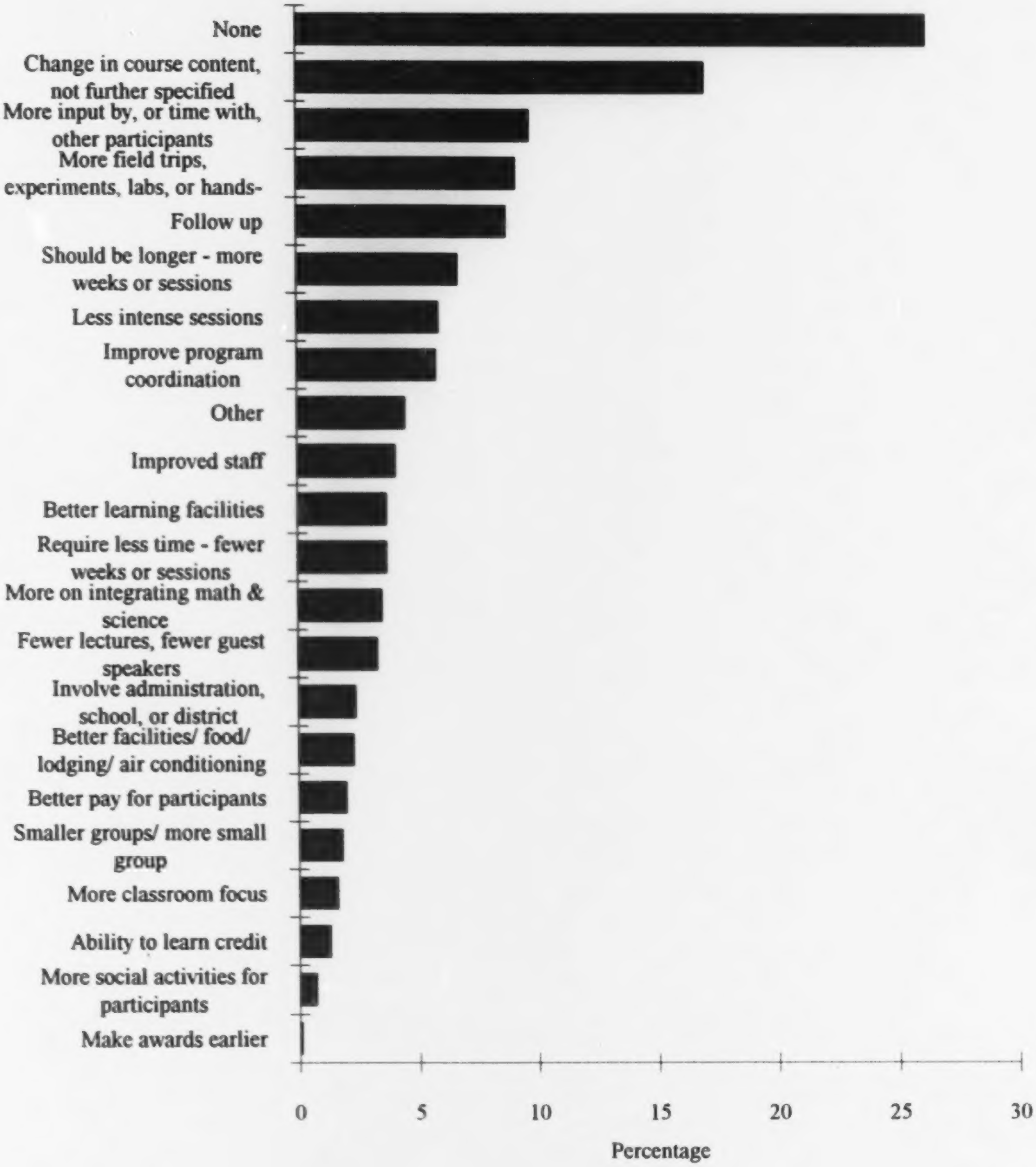
Participants were also asked to report any other observations and suggestions that they may have about the TEP program. Fifty-six percent responded to this question. These responses were most likely to be general positive comments about the TEP program (48.6%), comments on the professional benefits of participating in the TEP program (30.3%), and more positive remarks about the quality of the program instructors (19.4%).

With respect to making changes in the TEP projects, fully a quarter believed that no changes were warranted. "It was excellent as it was."

Seventeen percent suggested changes, however. "Time should be provided for teachers to construct teaching tools that can be taken back and used in the classroom", said one. Another observed that "there was an extraordinary emphasis on the writing of new laboratory experiences. This is a mistake! There are more than enough labs out there, we just need the opportunity to be exposed to them. ... you should develop teachers, *not* authors! Another wished that the PI would "change course from *doing* research to *learning* about subject matter and how it can be applied to the classroom."

Some participants stressed the importance of PIs obtaining more inputs from participants and of participants spending more time with one-another, while others stressed the importance of taking more field trips, shorter overall course length, follow-up programs, etc.

Figure 11.8 - Participants Reporting Important Changes They Would Like to See Made in Their TEP Projects



Source: Participant survey - Question 46d

Exhibit 11.8

Most Important Changes that Participants Would Like to See Made to Improve Projects

PART A. NONE (26.0%)

None. It was fantastic! Dr. Thielmann did a super job of organizing the project. • None. The "hands-on" and demonstrations give me great ideas for my own classroom. • Excellent as is, maybe *require* the computer section. I didn't take it and wished I had. • Not one thing! The institute was difficult, overbearing, intensive, exhaustive, etc. -- *but*, the learning, friendships, skills learned were incomparable to anything else I had experienced. • It was excellent as it was. I would like to see more followup time so that more solid curriculum integration might occur. This is true of *every* institute. • Actually, the Michigan TEP project was excellent. It would be hard to cite specific changes: living accommodations and food were superior; Michigan State Campus was lovely; staff were very strong; and their program and research was well developed. • None. Great teachers; great comradery among teachers participating.

PART B. CHANGES IN COURSE CONTENT (17.0%)

Time should be provided for teachers to construct teaching tools that can be taken back and used in the classroom. In my project we built probes and breadboards and then took them apart to build the next project. I think well planned student proof models should have been built. • More activities that we can use in our classroom. Given time to modify activities to be used in our rooms and discuss with our colleagues how it would be done. • In have participated in 2 NSF summer institutes in the last 5 years -- in each, there was extraordinary emphasis on the writing of new laboratory experiences. This is a mistake! There are more than enough labs out there, we just need the opportunity to be exposed to them. Most in our institutes lacked the creativity to write, you should develop teachers *not* authors! • More integration with other topics. I have been taking courses on the integrated classroom and in fact have established my classroom as one. It is a very positive way of learning "more" in an effective manner. I need more information on how best to integrate subjects most effectively. • Change course from *doing* research to *learning* about subject matter and how it can be applied to high school teaching. • Teach us more subject matter instruction in classroom setting. • It would like to attend another workshop where the work is more "task" or "project" oriented. The role of the college staff would be more of a consultant and less of an instructor. • I think this one "unfolded", which is best. The need to be flexible and careful listeners is vital. A major concern, especially the first summer, is that almost *none* of the science/math experts modeled good teaching. The lecture was the mode . . . and most of us were offended; the offended attitude got in the way of learning at times. • Better information and organization for out-of-state students (was the only participant not a North Carolinian). Organization/administration of NSF programs to follow the written guidelines of the stipends, mileage, fees, etc. for all participants. • A three-year commitment is very demanding emotionally and physically. I don't know if it is possible to accomplish goals expected in less time. However, with all of the "normal" professional and personal demands it is difficult to make a commitment for that length of time; the enthusiasm and dedication tend to lessen toward the end of the three years. • Have science *and* math people coordinate the program for math and science teachers rather than just math people. • Granting of M.S. degree at end of program with State certification in content area. • Extend the information by computer contact with a database for practice in regular enhancement as need arises in the school year. Establish a computer bulletin board for visiting instructors and TEP participants for later use when needed (especially valuable if TEP program could be permanently established for repeated participation). • Less lecture.

(cont.)

Exhibit 11.8 (cont.)

Most Important Changes that Participants Would Like to See Made to Improve Projects

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PART C. MORE INPUT BY, TIME WITH, OTHER PARTICIPANTS (10.0%)

More small group discussion; more sharing of experiences. • More time for project. • More workshops and teacher input. • I think the teacher should be recognized as a scientist in his/her own right and treated accordingly. A lot of time they (teachers) are matched up with and treated as college students in a summer enrichment program. • More small group question/answer sessions with experts. • Having mentors (supervision) that are creative in the Arts and Sciences and Math (problem solving, making prototypes, models, inventions, etc.). • Narrower grouping of participants. I was already teaching statistics and was mixed with teachers with no knowledge (tho' some divisions were made). We were also a group of 7-12 grade teachers. More time for individual study to let the ideas sink in. Many older teachers are a product of old teaching styles and while we need to become more accustomed to cooperative techniques, some of us still need solitary thinking time or lectures to sum it up. • Mix Chicago Public School teachers with suburban teachers. • I would divided the group part of the time (interaction among the intergroups is beneficial) so separate needs can be met. • More time to interact with other participants. • I would like to see some independent research -- but with other teachers in the educational environment for idea exchange. • Pre-project material should give better fore warning that there is a definite commitment of time involved to fully participate the project. I was unaware that so much outside classwork would be expected of me. • Group dynamics have to be taken into consideration. • More contact with other teachers. More chance to discuss what we were doing. • Less regimentation; more sensitivity to questions. The teacher was very insensitive to question; I felt very dumb whenever I asked a question. More classroom teacher input.

PART D. MORE FIELD TRIPS, EXPERIMENTS, LABS, HANDS-ON (9.0%)

The participants need *at least* some materials, supplies, and equipment in order to actually incorporate their newly gained knowledge and skills into classroom activities. • TEP project should be for younger teachers; I have very little time left before retirement to use this experience. • Less lecturer, more lab. • More, or almost totally teacher sharing or teacher taught with "hands-on" experience rather than lecture. This of course cannot be done until the teachers have been trained, but by the end of the first year, this should be the goal. I feel that I have learned the most through the teacher-taught sessions. • Less lecture; more hands-on material.• Three weeks is too long; 2 weeks is better. More field trips -- teachers like to have fun. • I would like to see some way of having followup with the group involved in order to keep the concepts and enthusiasm alive. • Continuing followup either through release time or two-day summer retreats. • I definitely would like to see followup to the program. In rural areas, support for new programs from a college level is a must if the program is to continue. • More computer integrated curriculum. • Field trips should be in surrounding areas -- often the travel time could be put to better use. Local trips were more effective and personalized for me.

11.7 PI Suggestions to the NSF Regarding Ways to Improve Support that it Provides to PIs

The majority (57.8%) of PIs had suggestions on improving NSF support to PIs. The most frequent observations concerned the need for more lead time between notification of award and project initiation, more communication among PIs, more funding from NSF, better access to NSF staff, and NSF's good work and support (see Figure 11.9).

Twenty-six percent of responding awardees mentioned the need for more lead time from NSF, in particular, earlier notification of the award. One PI noted that "we had to delay our project for one year because of a late decision," while another observed that "earlier notification of awards is critical in recruiting participants." Related to this, one PI stated that "timely funding is critical to proper program promotion. Quality is compromised badly when funding authorization is late." Over time, the concern with limited lead-time dropped slightly.

Twenty percent suggested more communication among PIs as a needed NSF improvement in support of PIs. One PI observed that we "need to share more success stories with others. A lot of wheels have been re-invented." Various communications devices were mentioned, such as conferences, E-mail, rotating apprenticeships, and PI networking.

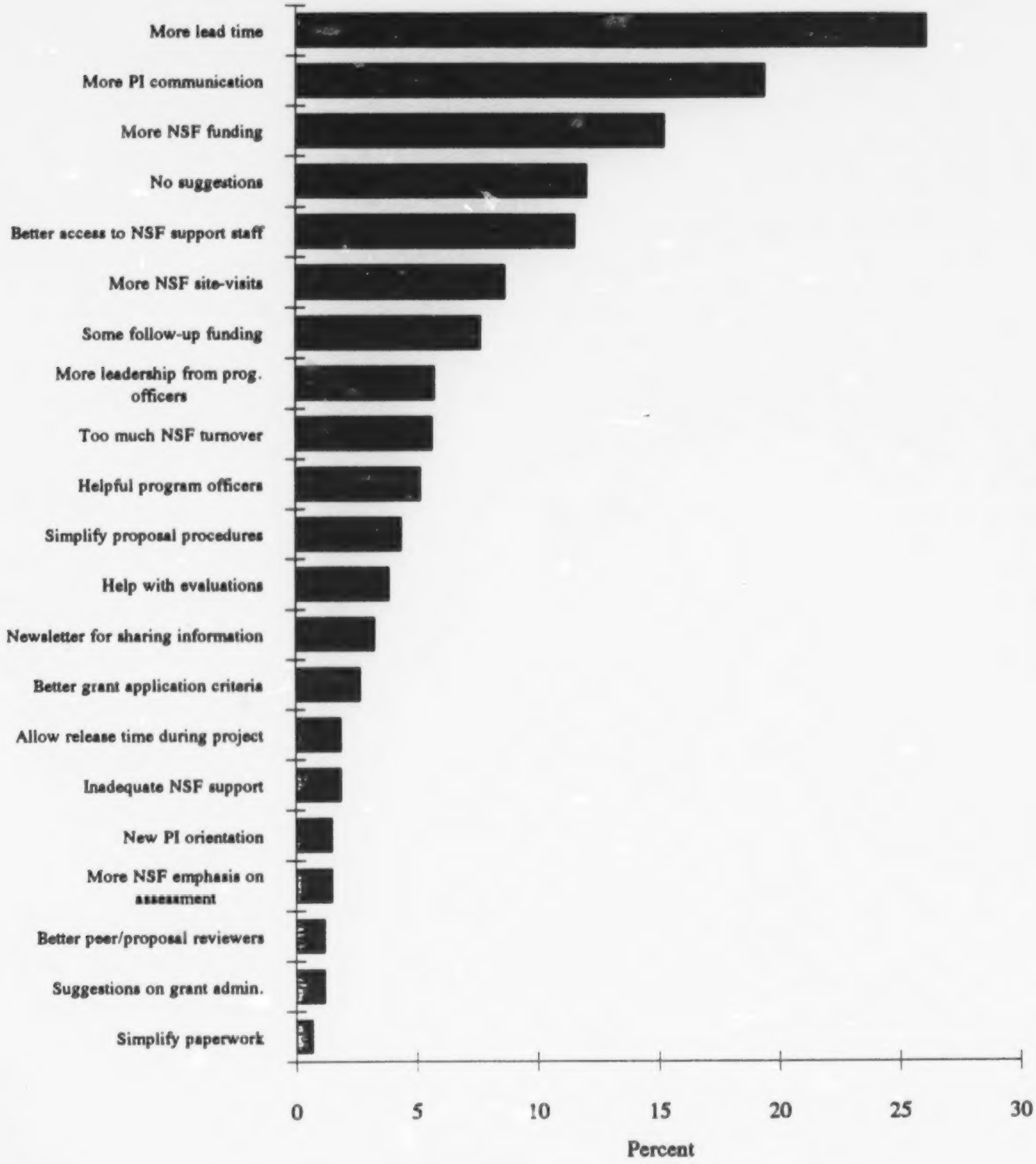
Fifteen percent mentioned the need for more funding from NSF. This included adequate funding for longer periods, money for evaluations, and improved methods for cost sharing.

Twelve percent cited the need for better access to NSF support staff or the need for more helpful support from the program office. Suggestions included providing funds for travel to NSF for PI conferences, and assistance with budget planning. Principal Investigators stated that NSF appeared "seriously understaffed."

Twelve percent reported that they received adequate to excellent support from NSF staff. One observed that "my support has been wonderful", while another observed that NSF does an excellent job with PIs considering the project officers' work load and the support staff available to them." "They have dealt with us in an encouraging and professional manner", remarked a third.

Figure 11.9

Principal Investigators Suggestions for NSF Regarding Ways to Improve the Support it Provides to PIs



Source: PI Survey - Item 40f

Exhibit 11.9

Ways that NSF Might Improve the Support that it Provides to TEP Principal Investigators

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PART A. MORE LEAD TIME (26.2%)

Provide more lead time • Timely decisions on funding. We had to delay our project for one year because of a late decision • Earlier notification of awards is critical in recruiting participants • Projects need a minimum of 6 months lead time to be successful • We spent needless time and effort on the problems produced by late notification • More lead time to let teachers know about the project and so they can plan • Earlier notification of funding • Receipt of grant letters in March or April is a great handicap • Timely funding is critical to proper program promotion. Quality is compromised badly when funding authorization is late • Notify the institution at an earlier date • Late notification of the grant threw off our start of the project and we were a whole year trying to get caught up • Complete negotiations and award notices sooner so that advertising and applications can be sent in a timely manner • Proved quicker responses to negotiations • Will not allow a PI to start work on a project until a letter is in hand • Proposal review time is too long • Notify regarding funding as far in advance as possible so that institute faculty can make summer plans.

PART B. MORE COMMUNICATION AMONG PIs (19.5%)

Directors Meetings • Need to share success stories with others. A lot of wheels have been re-invented • Disseminate successful program models • Principal Investigators need more opportunity to share success (and failure) stories • E-mail network • Support for PIs to interact with other PIs in a small group setting to share ideas • Principal Investigator exchanges, a kind of rotating apprenticeship • More opportunities to exchange ideas with participants working on similar type projects • Get PIs with like projects together • Principal Investigator meetings • More PI networking, PI collaboration • More communication between PIs working in the same area • A periodical for sharing of operational information among PIs • More info on other projects • Conferences that bring PIs together for sharing and mutual support • There are many Teacher Enhancement Projects and yet each PI knows very little about any of the other projects • More extensive sharing of ideas, models, and successes • Please promote more networking among PIs.

PART C. MORE FUNDING FROM NSF (15.3%)

More funding • Don't feel we had money for outside evaluations • Adequate funds for longer periods • NSF should look into developing improved methods for cost sharing projects with other federal government agencies. • We are always handicapped by the fact that funding has been for only one year, so I could never guarantee my staff any continuity, nor could I make long-range planning. • Longer commitments (3-5 years). Most programs require a period of years to be come established. • Fund follow-up projects after tremendous investments and successes of project. • Give support for a longer period of time. Provide adequate funds for outside evaluation. • Provide support for long term evaluation studies. • Encourage continuation grants. As mentioned above, applications for the continuation of mature programs might be encouraged and greatly streamlined. • Longer term projects (certainly longer than 2 years).

(cont.)

Exhibit 11.9 (cont.)

Ways that NSF Might Improve the Support that it Provides to TEP Principal Investigators

PART D. BETTER ACCESS TO NSF SUPPORT STAFF, UNHELPFUL PROG. OFFICE (11.6%)

Require PIs to include travel to NSF PI meetings in project budgets • Need to be in closer contact with the Foundation staff, which is currently seriously understaffed • Give more direct guidelines on changing budget items when necessary • It would be better if NSF had sufficient funds and personnel to provide more support for the PI. • Regular site visits by program officers. • It seems that the NSF strategies shift with every new program director or monitor. • Program directors at NSF do not recognize field trips as a learning tool. • We would be delighted to visit with you regarding our efforts. • Less turnover, please, in program officers. • Regular site visits by program officers. • Regular written communication directed to the Principal Investigator. • Site visits by the program officer. • A single contact point at NSF for the life of the project. • Have NSF staff visit projects. • I need more instruction on how to administer the grant. • More ongoing contact with program officers. • The greatest support would be to maintain and retain one project director (NSF) with a given project. • For a three-year project, at least one visit should be made. • What support!!? • Try to have more continuity with program directors. This project had 4 different NSF PDs in 2-1/2 years. • Less turnover in project officers. • Spend some time with "rookie" on items pertaining to budget. • It's difficult to deal with transitions in NSF staff and to receive conflicting advice with respect to procedures or the content and direction of proposals. • Frequent changing of NSF staff members is very frustrating. Their approaches and priorities can change so drastically. • Continuity in program officers would be enormously helpful. • The transients of NSF project directors leads to inconsistencies in advice and evaluation. • Reduce the workload for program officers so they can better monitor projects under their jurisdiction.

PART E. RECEIVED ADEQUATE SUPPORT, NO SUGGESTIONS FOR IMPROVEMENT (12.1%)

No suggestions • My support has been wonderful. Staff seem too busy for good health • Once funded, there is more than adequate support • Have always found support for PIs helpful and friendly • Have found the support very good • Program officers and staff have been most supportive • Keep doing as you've done, NSF support was exemplary • NSF does an excellent job with PIs considering the project officers work load and the support staff available to them • The support is very good • See very little need for other kinds of support for creative PIs • They have dealt with us in an encouraging and professional manner. • The support and encouragement provided by the program officers is excellent. • Also, the program officers are very helpful in their advisory capacity. • NSF believes in and trusts its project directors and provides the flexibility needed to run a successful project. • So far, I have been fortunate to get good support from NSF program officers. • The program officer for our project was superb -- answered questions in a timely and good fashion and was always receptive to questions. Very supportive and helpful. • It was excellent. • NSF has been very helpful. • The NSF project managers have been very good. • The staff at NSF have always been courteous and helpful to me. • Generally, I have been fortunate to get good support from NSF. Email helps, especially for a deaf person like me!

11.8 Recommendations From PIs and Participants to NSF on Improving Future TEP Policies and Program

Many PIs (46.2%) had observations on the improvement of TEP policies and programs. The most frequent categories of recommendation were project follow-up, more communications among PIs, more lead-time, and more funding from NSF (see Figure 11.10). Better access to NSF staff rose as a concern over time.

The chief recommendation for improving future TEP operations, cited by 156 percent of responding awardees, was that NSF should provide more follow-up funding for some projects. One PI suggested "optional five-year proposals" (presumably 3 years, plus the option for 2 more years). A second suggested allowing funding for "post-project analyses." A third suggested providing longer term funding for "proven successful projects."

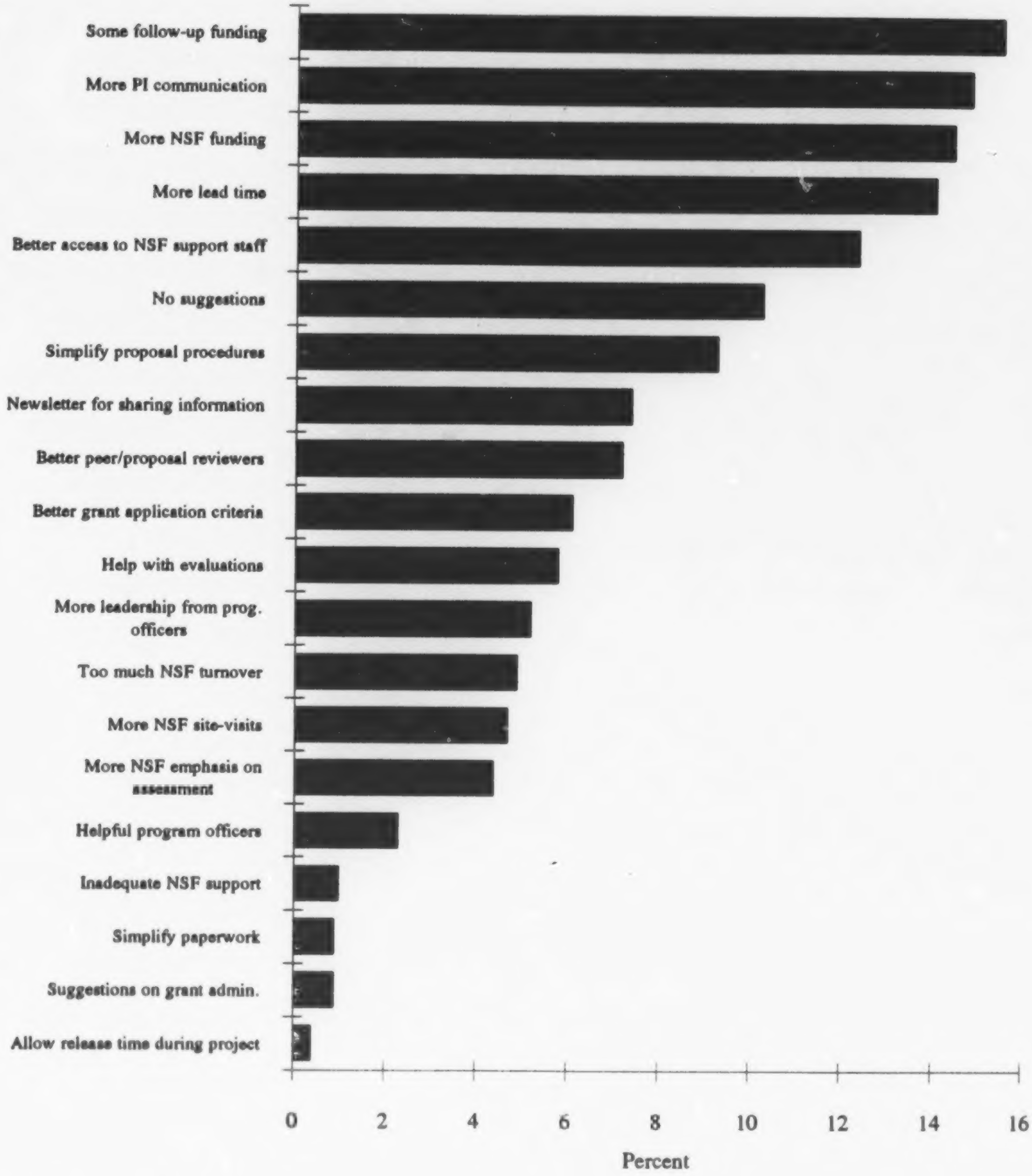
Fifteen percent want NSF support of greater communication among PIs. Regional meetings were suggested, while another suggested "working toward setting up a resources of teacher education materials, activities, etc." One PI observed that "there does not seem to be a high visibility means to share ideas and successes," while another encouraged NSF to "take a stronger approach to dissemination of good programs and ideas."

Fifteen percent cited the need for more funding from NSF. A number of comments concerned the relative paucity of alternative sources of funding for such workshops, and therefore NSF's special role. One PI noted "I worry that outside support is needed to continue our project which serves a very poor population with multiple needs for limited resources." Typical concerns also pertained to the duration of funding.

Fourteen percent mentioned more lead time, more advance notice of awards as an important needed improvement by the NSF in the operation of the Teacher Enhancement program. One stated, "I have been waiting for 10 months for notification on the status of a proposal I submitted." Principal Investigators emphasized the need for "faster response" to proposals, "earlier submission dates for proposals," and alerting PIs to the lead time problem. One PI suggested "the timing of award announcements should be such as to provide adequate lead time for the start-up activities of recruitment and program scheduling."

Figure 11.10

Principal Investigator Suggestions to NSF Regarding Ways to Improve its Operation of the TEP Program



Source: PI Survey - Item 40g

Exhibit 11.10

Ways that NSF Might Improve its Operation of the TEP Programs

PART A. PROVIDE FOLLOW-UP FUNDING FOR SOME PROJECTS (15.6%)

Provide long term funding for proven successful projects • Fund more than pilot program • Find a way to provide very long term funding for projects that deserve and need it • Optional 5-year proposals • Go beyond the limited objectives of most of the currently supported programs • Projects should be renewable after 3 years. • Allow money for post-project impact analysis • Fund multi-year projects so we can operate more efficiently. Each summer off means repeat start-up and recruitment. • Projects [that are] more long term, statewide, and systemic. • Special grants for publicizing good projects, PI workshops, newsletters, etc. • Teachers need continuing support and interaction with project faculty. In practical terms, this means they need support dollars in the summer. • Think in terms of longer funding periods, such as 5 years.

PART B. MORE COMMUNICATION AMONG PIs (14.9%)

Regional meetings • Development of collegiality • Regional meetings for PIs to share programs and write-up the successful programs in NSTA publications • Encourage and facilitate contact among project directors • Work toward setting up a resource of teacher education materials, activities, etc • Communication of ideas among PIs • Conferences have been valuable to exchange useful information between programs. NSF could further ongoing networking between similar projects • Project directors meeting • Does not seem to be a high visibility means to share ideas and successes. Why not do more to spotlight successful programs • Encourage the people who are associated with our program to approach other organizations and institutions to encourage the establishment of a similar program • NSF should take a stronger approach to the dissemination of good programs and ideas. • Having a professional (subject-matter) colleague to talk with is essential. • Write articles in NSTA publications on the effective programs and have regional meetings so that PIs can share ideas and projects. • Encourage more teachers to run their own workshops. We know what works with our colleagues. • Have some regional meetings describing the program for interested grant-submitters as well as school people and others who want to know about it. • Long-term interaction between staff and participants and between participants among themselves is essential to making a lasting change in attitudes and teaching philosophies. • NSF Teacher Enhancement conferences have been valuable to exchange useful information between programs.

PART C. MORE FUNDING FROM NSF (14.5%)

Very satisfied except that the expectation of finding alternate funding sources is unrealistic • Our project was not funded during its fifth year. We had an excellent program going that should have continued to be supported • I worry that outside support is needed to continue our project which serves a very poor population with multiple needs for limited resources • Greater flexibility in maximum allowable stipend to teachers is needed • Financial and institutional support for increased ways to foster project dissemination • Fund more programs • Move toward funding more "cutting-edge" ideas. • Many teachers were unwilling to commit to our 7 week, full-time, 3 summer program. A larger stipend would constitute a positive incentive. • Allow for modest equipment purchases and help schools get equipment and supplies as part of the basic stipend or funding process. • Fund teacher substitute release time. School districts do not have enough funding for teacher professional development and it is getting worse, not better. • Seek more support from the Congress for the TEP -- it is an important and effective program for improving mathematics teaching in the nation's schools.

(continued)

Exhibit 11.10 (cont.)

Ways that NSF Might Improve its Operation of the TEP Programs

PART D. MORE LEAD TIME (14.1%)

Faster response • Too many delays in the review and funding cycle • Would like NSF to process review of proposals in much shorter time • The August 1st submission date is a serious problem to those who are operating a summer NSF teacher preparation program • Official awarding of grant is far too late in the year for a PI to recruit participants for summer program. It is a little unnerving to commit funds without a real guarantee from NSF • Shorten the delay time between submission of proposal and award of grant • Notify PIs of their award sooner • Very frustrating and the quality of the project suffered because of this delay • Timely appropriations made to NSF so that projects could be funded with enough lead time to adequately prepare for implementation • Have been waiting 10 months for notification on status of a proposal I submitted • Shorten response time to six months • Address the lead time problem • Need to make new PIs aware of the actual time needed to gain official notification. We thought we would know in 6 months • Reduce "red tape". • Timeliness in proposal review, notification and information. This can seriously compromise project effectiveness. • The timing of award announcements should be such as to allow sufficient lead-time for the start-up activities of recruitment, program scheduling, etc. • Time awards to provide adequate time to advertise and recruit participants. • We had a lot of logical problems because of [short lead-time]. • Re-examine proposal deadline dates and grant start-up timeliness.

Almost half of all participants had suggestions regarding the TEP program. As seen in Figure 11.11, when participants were asked for suggestions for NSF to improve its operation of the TEP program, the most common response was that NSF should either continue to increase funding for the TEP program (49%). Participants also cited better participant outreach and recruiting (12.5%), and unspecified suggestions for improvements in course content (12.2%).

Not surprisingly, given the overall high esteem with which the TEP program is held by participants, roughly half believe that NSF needs to maintain or increase funding for the projects. The following is an example: "Simply continue having such a program available for teachers. Possible more funding to enable teachers to purchase equipment they have learned to use. The university faculty were constantly amazed at what little funding was available at the secondary level for materials and equipment." Another participant suggested, "increase the number of offerings and the number of locations where offered."

With respect to improved participant outreach and recruiting, more outreach activity was recommended, especially with an effort to reach more rural participants. One participant observed that "too often, (the materials about TEP) end up on the desk of some administrator or department chair and do not get disseminated. Science teacher organization newsletters or NSTA contact persons are a good network to use."

Various course and content suggestions were also made. One participant observed the possible use of "high school teachers to plan and run (TEP projects). The college people are great, but they really don't know what we need." Another suggested the need for greater targeting of TEP projects: "Develop courses in the earth sciences and especially gear it to middle school education." Another suggested "find a good balance between objectives. Allow time to explore and use college resources."

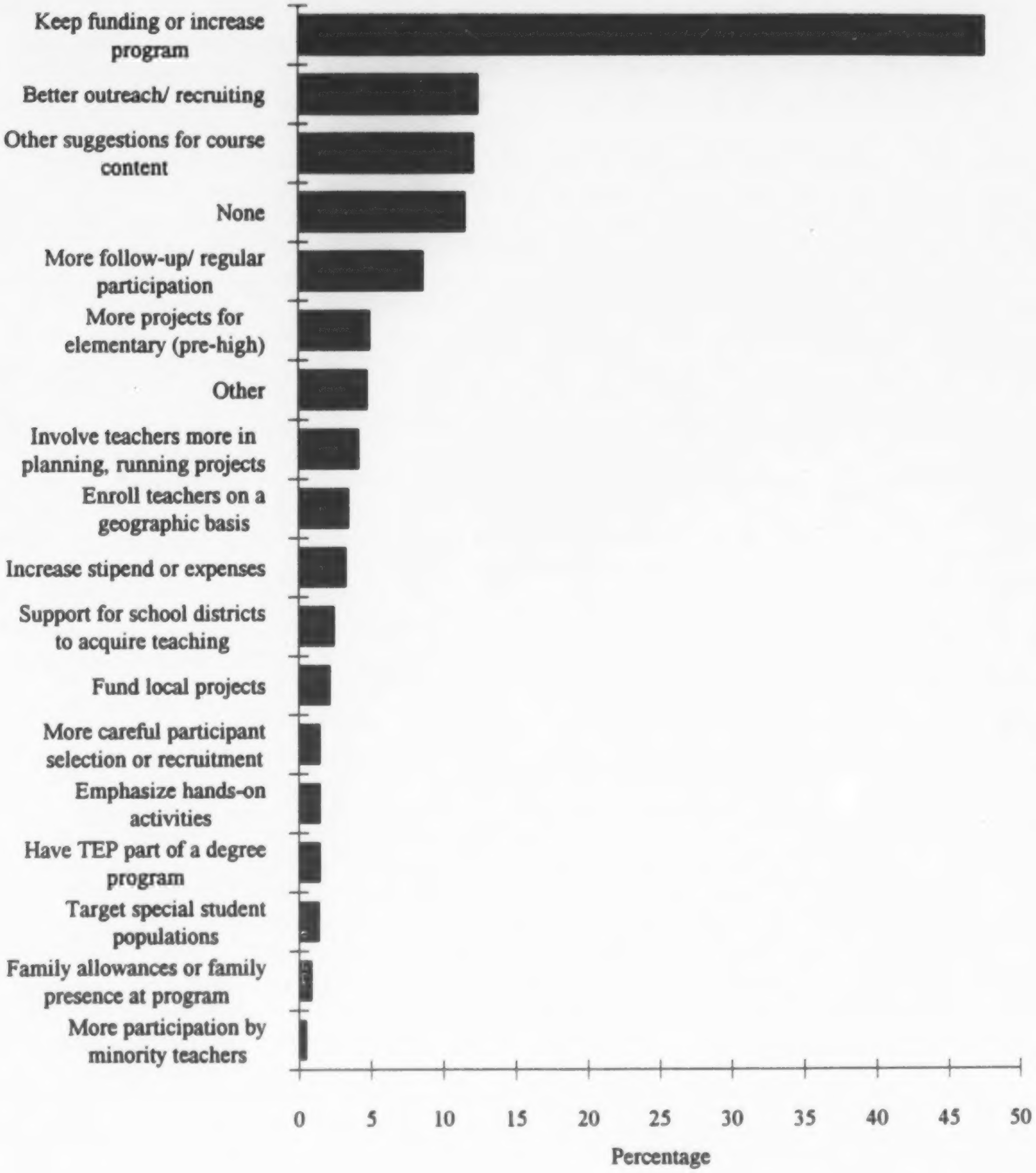
The need for greater minority participation was cited by 12 percent of participants.

11.9 Other PI and Participant Comments

Finally, both PIs and participants were provided the opportunity to make any other comments they wished. PIs focused on two themes -- almost two thirds stressed the importance of involving teachers in the learning process, while four in ten expressed concern about the level of support they received from NSF (see Exhibit 11.12).

Figure 11.11

Participants Suggestions to NSF Regarding Ways to Improve Its Operations of the TEP Program



Source: Participant survey - Item 46f

Exhibit 11.11

Suggestions for NSF from TEP Participants

PART A. KEEP FUNDING OR INCREASE PROGRAM (49.0%)

In 1969-1973, NSF supported teacher training that I had participated in. In 1989-90, I took party in the institute at Kent State; those 16 intervening years was too long for NSF *not* to support teachers and education at "our level" actively. If education has a problem in this country, its $ and "sense" from those who are supposedly leading education and the country!! • TEP for science and mathematics are only as good as the college people running them. I have been fortunate to be involved in two excellent programs at Kent, one at Ohio State, and another at Oberlin. I have been in teaching long enough to tell you that the most important government assistance to secondary math and science is through NSF-sponsored summer institutes. They are critical to our future. • Simply continue having such programs available to teachers. Possibly more funding to enable teachers to purchase equipment they have learned to use. The university faculty were constantly amazed at what little funding was available at the secondary level for materials and equipment. • Offer more programs such as this. • Continue to provide grants for programs such as this. • By providing room-board-transportation and expensive money this project allowed teams from all over the nation to participate; without those funds, many (myself included) could not have afforded this wonderful educational activity. It has also made me apply for many more such programs. • Please continue funding and followup funding for people to do work when they return to their schools. • Get some money to (lead) teachers in districts or (ISDs) for summer or evening projects and classes (classes for high school students). • Increase the number of offerings and the number of locations where offered. • Provide more programs for teachers in local school districts. • More funding to enable more teachers to participate in the excellent programs funded by NSF. The teachers in the program have been dedicated professionals -- I have gotten to know many of them and we work together to benefit our students. • Perhaps longer funding of individual grants would help educational change to take a firmer foothold. • Please offer more workshops like UMI, it was practical, exciting and enjoyable. Fund follow/expansion reunions help teachers exchange ideas by making computer networks more accessible (especially financially).

PART B. BETTER OUTREACH/RECRUITING (13.0%)

Better advertising. Not enough teachers know these programs exist. • Sponsor sessions at national and state meetings to provide support to bring participants together on a long-term basis. This would allow teachers to continue improving and contributing to the project. • We, in a rural school setting, do not receive information about the programs available. Have the classes at various locations throughout the state. • Spread them out more thru the nation. Also increase participation of public school folk -- over 25% were private school teachers -- I doubt this percentage is in reality teaching kids on a per capita basis. • The availability of these programs needs to be advertised more widely as many teachers are not aware of them. • More of them for broader participation. Publicizing the grants and finding ways to get this information to the classroom teacher would be valuable. Too often it ends up on the desk of some administrator or department chair and does not get disseminated. Science teacher organization newsletters or NSTA contact persons are a good network to use. • It is an excellent program that should be publicized more readily so that interested teachers would know how to become participants in it. In my district, the administrators were informed and unless they were interested in science they did little or nothing to let anyone know of it. • More outreach to the schools and teachers involved. More support as far as materials are concerned; more emphasis on teacher-made materials. Sharing of ideas about

(cont.)

Exhibit 11.11 (cont.)

Suggestions for NSF from TEP Participants

PART B. BETTER OUTREACH/RECRUITING (13.0%) (cont.)

teacher-made materials that can be used in classrooms. Produce a journal or book on teacher-made materials that can be used as a resource.

PART C. COURSE AND CONTENT SUGGESTIONS (12.0%)

Use high school teachers to plan and run them. The college people are great, but they really don't know what we need. • Provide ways for "local" sharing beyond the national program. • Many practicing teachers have excellent ideas. The vast majority have neither the time nor the expertise to write a grant application. Find ways to involve these people. • Favor those proposals which 1) require projects; 2) require presentations at inservices, such as state science association meetings; and 3) are geared to elementary and middle school science programs. • Projects which enable working teachers to keep up in their fields are needed -- the kind of course which enables teachers to catch up on the last 5-6 years are very important. • Teacher enhancement programs need to focus on development and use of hands-on activities and teacher attitudes that will enhance the implementation of activity-based science. • Develop courses in the earth sciences and especially gear it to middle school education. • My teacher colleagues often complain about poor preparation in sciences and math on the part of their students. Perhaps TEP courses for intermediate (or junior high) and elementary school teachers would prove helpful. • Keep it simple, but involve the students. • Find a good balance between objectives. Allow time to explore and use college resources. You are not buying us for 3 weeks. Treat us like professionals not Jr. High students. 3 semester units for 3 weeks (plus activities afterward) Several years followup would be best. Projects should be divided according to Jr. High/High school. Rang from 6th grade to 12th grade calculus courses "social class" to develop. Don't try to cover too many objectives. Teaching content, methodology, recent research, computer programs is too much. Could use training on presenting and planning workshops if we are to do these upon return. Would suggest project dealing with the use, writing, etc. of alternative type tests and assessments. Math Networks for schools without math coordinators would be a good project too. • Emphasize more math -- not less! • Projects are needed for "at risk" students and students placed in grade levels due to age who have little prior education. Projects need to address interests of the age addressed.

PART D. GREATER MINORITY PARTICIPATION (12.0%)

If impact on minority students is a component, increase minority (African American, Hispanic) participants in TEPs. Look at -- develop projects that will direct impact on the improvements of teaching "needed" populations (again Black, Hispanic, poor Whites, children of impaired parents -- drugs, alcohol, AIDS) from America's inner city school systems. However, those at the helm must reflect the population and have a real understanding of the needs and a vision (*long-term, not quick-fix*) of how to positively affect the problems rather than creating new questions.

Exhibit 11.12

Other Points about the TEP Project Experience

PART A. INVOLVE TEACHERS IN THE LEARNING PROCESS (61.4%)

Program which combines learning new topics with the development of curricular materials for use in the participants' classrooms proved valuable for the in-service teachers • We found dramatic increases in physics enrollment in many schools when the teachers returned with better understanding and methods • Teachers appreciated being treated with respect and as peers • Important to convince the teacher that they need not be an expert in all aspects of science but rather a continuing co-learner with their students • Participants had ownership to give them reason to be productive and thus self-motivated • Led to may friendships and synergistic approaches to strengthening education • Teacher-tried and it works • Build confidence in the teacher as a science teacher and confidence in the learning process • Have been able to get elementary and high school teachers to work well and effectively together • Teachers are starved for some form of assistance • Deep involvement of elementary teachers in their own learning of science • Emphasized it's okay not to know something and helped them become proficient in the ways of finding out • Teaching professionals should be used in pre-service education • The presidential awardees should be utilized as master, model, mentor teachers • The apprenticeship model turned out to be successful • Teachers like other professionals, learn more readily from their peers than any other source.

PART B. POOR SUPPORT FROM NSF (40.0%)

NSF and its reviewers did not understand the morale-oriented ideas • Subsequent NSF proposal was rejected. Proposal would have allowed the program to achieve more permanence • We were beginning to get somewhere when the school's continuation grant was not funded • NSF spent over $1 million and the project was successful yet there was no follow-up • NSF really put a cramp in the project by removing all monies we had budgeted for software • We did not receive award notification until mid-April. This was very frustrating and the quality if the project suffered because of this delay • Supplemental funding to support additional participants or the funding of the project for another three years would have been very productive • The project was very expensive for the number of participants served. Group might have been better served by providing financial aid to attend workshops at national meetings • It was dramatically successful but I was unable to get a subsequent grant funded for new locations • We were not officially notified until May. This greatly hampered our recruitment process • NSF is not really supportive of K-12 institutes although they are very effective • tends to support new models in contrast to mature, well-developed programs such as ours.

With respect to involvement of participants, "teachers appreciated being treated with respect and as peers." Similarly, "participants had ownership to give them reason to be productive and thus self-motivated. " Another PI stressed the "deep involvement of elementary teachers in their own learning of science."

Concerning the level of support received from NSF, a major concern was with follow-on funding. "We were beginning to get somewhere when the school's continuation grant was not funded." "NSF spent over $1 million and the project was successful yet there was no follow-up." A third remarked that "supplemental funding to support additional participants or the funding of the project for another three years would have been very productive."

Participants also had some other comments. Half of the participants took the opportunity to register positive comments about their TEP projects; other themes included professional growth, quality instruction, and the need to keep funding or to increase funding in the program (see Figure 11.12).

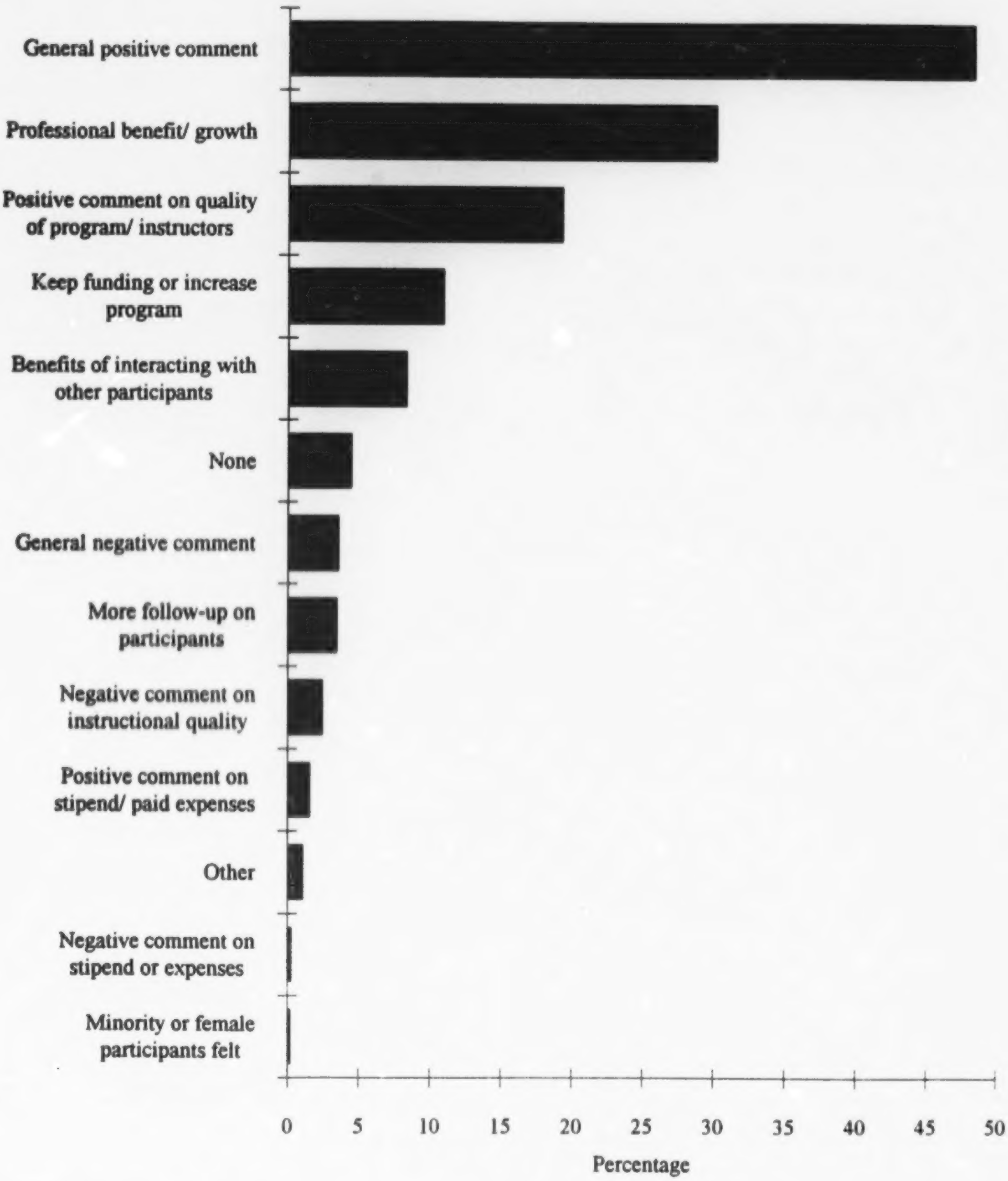
Half of the participants took the opportunity to praise the program in general (see Exhibit 11.13). "Superb! The coordination and activities were wonderful. I became aware renewed and excited," remarked one participant. Another summed up his feelings as follows: An "excellent program that provided academic grounding in subject matter, leadership skills, and provided an opportunity for participants to be on the cutting edge of math research, educational applications of new teaching methods, and strategies and the opportunity to be a part of planning the future of science and mathematics education in the nation."

Professional benefits were also cited. *Summer Math for Teachers* was the most powerful, professional thing I have ever done. It changed the way I teach everything. Thank You! Another observed "It was the single most influential program that I have attended in terms of continuing impact on my teaching." A third stated that "This program turned my professional life around -- it recharged me!" Many individual PIs were singled out for their outstanding work, and many comments were made to continue or expand financial support for such efforts.

Thirty percent of participants took the opportunity to praise the professional benefits, growth, and enhanced teaching capability as outcomes of their experience. For one participant, "*Summer Math for Teachers* was the single most powerful, professional thing I have ever done. It changed the way of teach everything. Thank You!" Another stated that "it was the single most influential program that I have attended to terms of continuing input on my teaching. I still actively work on developing materials started in this program."

Figure 11.12

Participants Reporting Other Considerations



Source: Participant survey - Item 46e

Exhibit 11.13

Other Comments by Participants About TEP

PART A. GENERALLY POSITIVE COMMENTS (49.0%)

Superb! The coordination and the activities were wonderful. I came away renewed and excited. • It was worthwhile; very educational. • Good workshop, instructors, usable material, and good followup. • This was the best workshop that I have every attended. This approach impacts education immediately. I strongly suggest that you continue this approach because it is quite effective. • Excellent program that provided academic grounding in math, leadership skills and provided and an opportunity for participants to be on the cutting edge in math research, educational applications of new teaching methods and strategies and opportunity to be a part of planning the future of science and mathematics education in the nation. • The EMAT project was the most enjoyable rewarding and successful format for dispersing information and expanding horizons. • Well organized, presented, and excellent staff. • Outstanding project. • I have recommended this project to many teachers. Of all the courses I have taken over the years, this one offered the most information and was the most practical and the most enjoyable. • I'd like to see more people from urban schools participate. • Since I began Summer Math in 1986, I have a new Master's degree plus 17 more credits, and am in the process of applying to a doctoral program. These changes, including community leadership roles I took on, would not have been possible, but for the confidence I have developed as a participant in this program. • The TEP is fantastic! It provides valuable experiences for teachers at all stages of their careers. Sea Semester was outstanding. The staff was as highly trained, professional and effective as any I've seen. • The time at UMI was a turning point in my professional life; it energized me and my classes. Our school has gone from 2-3 physics classes to 8 (with 3 instructors). Last year, I was nominated as Teacher of the Year for WDIU (TV) - Newsweek last year, and am having the time of my life. I can't thank UMI's Dick and Rae enough as their personalities helped make the workshop a dynamite occasion. • The second session was the session that seemed to pull it together for me. The intensity, focus, and collegiality was exciting. • The project was high quality because the instructors were experts, the participants were engaged in learning, and there was a stipend. • An extremely valuable experience. • Excellent program, very innovative -- informational. • Very practical and rewarding. • I love the program. In my spare time, math and science puzzles, games, etc. have become a hobby of mine. • The best teaching ideas I've learned have come from the NSF programs. I hope to get to participate in more. I've made lasting friendships with teachers from all over the U.S. • Manomet Bird Observatory -- tremendous, spectacular and a true learning, living and loving experience. I grew as a person, a student, and a teacher thanks to the knowledgeable staff and the varied modalities they used. I having nothing but praise for the tremendous growth that was offered me.

PART B. PROFESSIONAL BENEFIT, GROWTH, CHANGE, ENHANCED TEACHING (30.0%)

Dr. George was an inspirational teacher. Being sequestered with a group of peers at Marshfield College was an important part of the program. Participants learned a lot from each other after the formal instructional hours were over. We lived with our common interest -- chemistry -- for 3 weeks. • I greatly appreciate the opportunity I had to participate in this program. College courses do not always cover the needs of the teachers. This program helped me to a great extent and, in turn, helped my students -- because of my new-found knowledge and enthusiasm. • *Summer Math for Teachers* was the single most powerful, professional thing I have ever done. It changed the way I teach everything. Thank You! • On the whole, I was greatly pleased. It was an excellent program which has enhanced my

(continued)

Exhibit 11.13 (cont.)

Other Comments by Participants About TEP

PART B. PROF. BENEFIT, GROWTH, CHANGE, ENHANCED TEACHING (30.0%) (cont.)

personal teaching ability. • Very worthwhile -- 3 weeks of true "teacher heaven." Very stimulating. The exchange of ideas from across the states was great, but at the time, I was the only one from Texas and it was difficult to make waves. • In a TEP project, the goal is usually to make teachers better and I felt like I gained just that. However, there is no way to assess that because all the public cares about is standardized test scores. The issue is not whether the student can now see the bigger picture or have investigative skills for problem solving, but whether the student can solve little word problems that are really computation on the ITBS. • A very valuable tool for professional growth. The reasons why implementation of ideas and techniques were difficult had to do with my individual school, its politics and problems. • It is definitely worthwhile for a teacher to participate in the TEP project, but then its the teacher's responsibility to apply what he/she has learned. • Excellent program -- am very glad I took it. It has given me many ideas -- or "spin-offs." Another followup program at this point in time would be appreciated. • It changed my teaching techniques and philosophy. I now demonstrate many more reactions, etc. and provide more laboratory experiences. I also started a *Chemistry for Kids* summer course for 3rd to 5th graders that has been very successful. • It was the single most influential program that I have attended in terms of continuing impact on my teaching. I still actively work on developing materials started during this program. • This program turned my professional life around -- it recharged me! • The program made me feel really good about being an elementary science educator. It renewed my faith in teachers in general, as most of the participants were impressive. I have participated in 4 of these, this one was the best. They are fantastic educational experiences for those who have positive attitudes. • This project on *Middle Grades Mathematics* really did make the difference in my teaching. I was exposed to so much math that I would never have had the opportunity to learn about. I now continually seek the latest research and eagerly incorporate it in my class. I only wish I could continue with my learning. • I found it a very worthwhile experience and would very much like to repeat the process in discrete mathematics -- of which I know little -- and algebra which needs to be revamped. Teaching 6 classes and 4 subjects, I do not have time or energy during the year to create my own materials. The TEP project provided me with materials and experience in how to use them.

PART C. QUALITY OF PROGRAM INSTRUCTORS (19.0%)

Mertens/Hendrix were tremendous. The experience changed my life dramatically. I became more confident of myself and have tried a number of things I would not have done before Ball State. • Jeane Joyner and Gwen Clay have been fantastic! Jeane's organization and availability have really given us so much. Gwen's mathematical knowledge and enthusiasm pushes us to strive for improvement in our skills and knowledge. Bob Jones has given us enough flexibility to make the best of our opportunities. Jeane has allowed us to make suggestions/changes -- but has kept the goals of the project in tact. • Benedictine College staff were excellent; facilities were good. • Jay Hackett and Debbie Powell did a super job, hats off to them! • The faculty at the Virginia Tech Program were a tremendous source of new information and ideas. I was one of the few experienced physics in the program, yet I learned a great deal and saw the great strides that the other participants made in the program. Drs. Long, Bowden and Teates are exemplary teachers. • My summer was the best possible learning experience I ever had. Our instructor was very present to us, he knew his material, but let us explore and learn on our own but each evening

(continued)

Exhibit 11.13 (cont.)

Other Comments by Participants About TEP

PART C. QUALITY OF PROGRAM INSTRUCTORS (19.0%) (cont.)

we pooled our share of the truth so everyone ended each day with the entire truth clear in their minds. • The instructors were enthusiastic and dedicated as well as knowledgeable. • Instructors worked very hard and all were excellent. • This TEP program made me realize that "women and minorities" are still considered 2nd best. It was made known to us that we were a burden -- after all these years -- this still leaves a bitter taste. All other TEP programs I have been involved in were well run and extremely beneficial. This leads me to believe that the feelings of the Western Parklands Workshop were due to the personality of the director. • I found the information presented helpful to me. The instructors were excellent -- knowledgeable and caring. • E. Jay Sarton, Kopernik Observatory and Roberson Center science direct in Binghamton, NY was the strongest asset of the project. He was/is an outstanding teaching model for inquiry learning. • Dr. Rogers of MSU in Lake Charles, LA is excellent! He care -- he's concerned. He put forth tremendous effort and I feel that he was instrumental in my continuing with the TEP project.

PART D. KEEP FUNDING OR IMPROVE PROGRAM (11.0%)

The program was exceptional. Through NSF's funding very significant gains were made in many classrooms. • I would like to have followup, a level of the geometry workshop held another summer, or perhaps one in something other than geometry. The stipend made it all possible. Thank you! • Continue it -- continue to compensate participants and offer graduate credit. • I feel that TEP projects are vital to improving how teachers teach. However, they are often given for a small region of teachers and so are not accessible to many teachers. Being from Nevada, I have found few programs which are open to me (as opposed to residents of California, etc.). Primarily, the projects are open to teachers near the institution -- since our university does not (apparently) apply, teachers in our area have a difficult time participating. Those which are offered regionally or nationally are sometimes not announced through sources we receive. I get a booklet listing funded programs (or have for the last several years). Very often I see projects which sound interesting but are not for my region or which filled months before I knew about them (i.e., communication of projects, particularly in isolated areas, would be one way to improve the program). • Resource center should be fully funded and staffed and made available to local teachers and students. • Overall, NSF can have a great impact upon science teaching through TEPs. I don't understand NSF's reluctance to fund more TEPs. • Excellent! I believe many more programs like this should be available in other subject areas. I think it is essential for teachers to keep learning and talking with colleagues across the country. Also, it is important that teachers who are willing to devote the time, not have to incur any expenses. The fact that expenses were paid with an honorarium was great. • TEP must continue and expand. These funded programs provide excellent opportunities for teachers and their college instructors to improve teaching and learning form themselves and their students. WE teach and learn -- everyone grows from it. • They should continue with more money, more time, and more teachers to attend. Our students cannot learn, unless the teachers are better informed. • I was very satisfied with the TEP project in which I was a part. I certainly want to encourage the NSF to continue to fund TEP projects. They are really important four our teachers but much more important to our students. • I believe these programs are vital to the science teaching profession. I just wish more

(continued)

Exhibit 11.13 (cont.)

Other Comments by Participants About TEP

PART D. KEEP FUNDING OR IMPROVE PROGRAM (11.0%) (cont.)

teachers could attend them. • I would hope NSF would continue to fund such programs. Drs. Stockelburg and Dubensky took a chance in setting up the program for us. I would hope our "Education President" would support funding so that others could gain that same exposure to "newness and challenge' that we received. • I think all teachers should have the opportunity to attend. It should be party of a district's budget. There is an unidentifiable value just being with professionals from all over the country. It expands personal awareness; creates pride in the profession; and makes people reach to new levels. Teachers rarely get the opportunity to see how they "fit: in the big picture of education. • Keep up the program. Continue to support great college teachers and good high school teachers who want to become even better and more valuable to their schools and students. • I think these programs are great and should be increased. Many of the new teachers should be encouraged to attend these programs and exchange ideas with teachers from other parts of the country. • Wonderful. It allows me to improve my abilities yet not financially burden my family by the loss of my summer income. Without it I would not be able to participate in these summer projects.

Twenty percent commented upon the quality of instruction. These comments focused on the combination of substantive expertise and teaching capacity. "The instructors were enthusiastic and dedicated as well as knowledgeable."

12.0 CONCLUSIONS AND RECOMMENDATIONS

This study of TEP projects provides an unusual evaluation opportunity which builds upon data and observations provided both by the TEP project PIs and by participants in TEP projects. In certain cases, data may be drawn from only one group while in other cases PIs and participants both provided data on the same subject.

Examples of data provided uniquely by PIs concern what their objectives for their TEP projects were, how much additional financial and in-kind support they obtained, contributions by the host institution, etc. Likewise, participants uniquely provided data on their own goals for participating in the project, characteristics of their past and present careers, their own impressions of the project, and so forth.

Despite the presence of information that could only come from one source or the other, many facets of this evaluation drew complementary information from both PIs and participants. As illustrations, both surveys obtained data on: the characteristics of the participants such as age, gender, race, ethnicity, and educational background; school district characteristics; TEP project contents covered in the courses, and instructional methods used; uses of materials from TEP in subsequent teaching activities; participants' conduct of inservice training in their districts, and so forth. For many of these latter topics, PIs provided information on what they *believed* to be the case, while participants provided the same information concerning what (in their eyes) was *actually* the case.

The presence of these two perspectives on many of the same topics provides a form of validation regarding TEP accomplishments. If both PIs and participants independently confirm that something was the case, one may have greater confidence in the finding than were only one party to have done so. In certain cases, participant reports may be at variance from those of PIs and where this is so, it is noted.

A final observation is that one perspective is *not* included in this report: that of the students with whom the TEP participants work. For this reason, even where participants and PIs agree that something of value has been accomplished for students (e.g. improved teacher performance is associated with increased student motivation, enjoyment and accomplishment in science and mathematics subjects), such conclusions must be recognized as the perception of such change rather than a confirmed fact. Even with this specific constraint in mind, a great deal has been learned through the dual approach accomplished through the paired PI-participant surveys.

This chapter is divided into three sections. First, the accomplishments of the individual projects are examined. Second, the correspondence between TEP accomplishments and the larger program and policy objectives of the TPE Division, the EHR Directorate, and of NSF itself are considered. Third, some program and policy implications from this study are explored.

12.1 Accomplishment of Goals and Objectives by the Individual Projects

One fundamental concern of this evaluation was with the extent to which the individual TEP projects were able to accomplish a variety of objectives established by the Teacher Enhancement Program of NSF. In this section we identify six areas of goal accomplishment by the collective TEP projects. First of all, the TEP projects are clearly reaching teachers; at the time of enrollment 98 percent of all participants were working in the classroom.

Second, TEP participants were especially pleased with the operation of their TEP projects, with particular praise given to PIs for their mastery of content and subject matter, responsiveness to participant needs, and overall quality of the program.

Third, the participants report a variety of improvements in their approaches to teaching as a result of their TEP participation; they are more likely than before their TEP participation to use hands-on and demonstration approaches, to help students to find their own solutions to problems, and to use various assessment approaches to gauge student learning.

Fourth, they reported changes in student behaviors, including increased enthusiasm in class, involvement in science projects outside of class, and increased participation in science fairs or contests.

Fifth, following TEP participation, a variety of participant leadership activities were reported to have increased, including the making of presentations to teachers outside of their own schools, mentoring teachers in their own schools, and organizing other activities outside of their schools.

Finally, in the eyes of the participants, the TEP program is clearly an overall success, with 81 percent stating that they "would strongly recommend the program to others."

Certain important relationships emerged in the study of participants with respect to outcomes and impacts of the TEP projects. Three stood out. First, TEP projects which focused on either math or science instruction were rated higher than those which target both; this was especially true in the lower grades. For example, teachers of kindergarten through fourth grade students who attended math programs aimed specifically at their grade level were near unanimous in assessing the overall quality of their projects as excellent; smaller percentages according similar ratings to projects with no discernable grade level focus.

Second, the minority status of participants affects the perceived importance of the TEP objective of motivating female, minority, or disabled students. While 58 percent of minorities felt that this goal was very important, only 23 percent of non-minority teachers felt the same.

Third, about one-third of the participants reported that they encountered barriers to implementing content or methods learned in TEP in their school districts. The most likely teachers to report such barriers were those coming from poorer districts, and teachers coming from districts outside of the area in which their TEP project was located. Sixty percent of those reporting such barriers specifically identified lack of funds, supplies or materials as the source of the problem.

As documented in Chapters 2.0 through 11.0, the individual projects were successful in accomplishing a number of other specific TEP objectives:

- The TEP projects clearly stimulated the development and documentation of new methods and materials for in-service education tailored to elementary, middle, and high-school teachers.

- The TEP projects provided teacher participants with opportunities to learn disciplinary concepts and processes and effective teaching methods, as reflected in the impact assessments of both the PIs and the participants.

- Many of the PIs reported recruiting outstanding classroom teachers who would develop leadership skills to assist in improving the teaching practices of their less well-prepared colleagues.

- Likewise, PIs reported recruitment of less well-prepared classroom teachers with demonstrated needs but expressed commitments to pursue professional development -- an important target group for the TEP projects.

- Many of the projects provided the opportunity for teachers to share and work together in the local and/or regional settings to improve their own teaching under the guidance of the project staff. The amount of follow-up appeared to increase over the course of project years.

- Participants established continuing collaborative partnerships with faculty members of schools, colleges, and universities, as well as personnel from a variety of public and private organizations. Representatives of museums were an especially important source of expertise for TEP projects themselves.

- The TEP projects gave special attention to increasing student access to careers in science, mathematics, and technology by reaching teachers who are serving populations under-represented in the sciences as well as teachers serving economically disadvantaged communities.

- Both PIs and participants reported as one of their major accomplishments the expansion of participant knowledge of concepts and applications of science and mathematics.

- Another impact of these TEP projects reported frequently by both PIs and participants was the deepening of participants' knowledge and application of improved teaching methods, including an emphasis upon hands-on learning techniques and effective applications in the laboratory.

12.2 Accomplishment of TPE Program Objectives

It is useful to comment upon the achievement of overall TEP program objectives from at least three perspectives: those of the Division of Teacher Preparation and Enhancement, of the Directorate of Education and Human Resources, and of the National Science Foundation as a whole.

12.2.1 The Division of Teacher Preparation and Enhancement

As observed in Chapter 1.0, TPE has as its primary goal the strengthening of elementary and secondary science and mathematics education. The following two major TPE program objectives appear to have, by and large, been accomplished in the TEP program:

- Based upon both PI and participant reports, the TEP program appears to have supported well-designed projects that directly benefit the teacher-participants by making them more competent in the subject matter, more comfortable in its presentation, and more committed to their profession and their pupils; and

- In the judgment of the PIs and participants, the TEP projects have added to the base of knowledge about how teachers can most effectively be prepared and subsequently aided in enhancing their capabilities. There was a high degree of goal comparability between PIs and participants.

With respect to the latter point, PIs and participants have indicated both the types of materials and instruction that appear to work best, and the teaching models that are most suited for enhancing teachers' pedagogic abilities -- namely, hands-on instruction and peer group training procedures.

Several operational objectives emphasized by TPE appear to have been achieved through the TEP program as well:

- The TEP projects appear to have capitalized on the prestige of the NSF grant and exploited the Foundation's unique familiarity and relationship with the scientific research and education community -- perhaps best illustrated by the achievement of effective leverage of NSF funds and by the involvement of scientific faculty in the TEP projects;

- As was demonstrated by the broad base of project staff support (both paid and voluntary), the projects stimulated collaboration among such organizations as the Federal government, colleges and universities, state and local education agencies, business and industry, cultural institutions and media, and among such partners as scientists and science educators, other teachers, school administrators, and parents;

- According to PI reports, the TEP projects have led to some self-sustaining networks among these varied elements -- cooperative patterns that will continue to function, supported by non-NSF funds; and

- The individual TEP projects did a good job of focusing resources and using in-service approaches that appear to be widely applicable to strengthening science and mathematics education.

Finally, many TEP projects involved the formulation, testing, and refining of various approaches to in-service education -- with three out of four PIs reporting that they utilized evaluation methods to objectively assess project performance or accomplishments.

12.2.2 The Directorate for Educational and Human Resources

Within NSF, the Directorate for Education and Human Resources defines and funds programs and projects that support NSF's educational mission. This directorate has four long-range goals to help ensure that:

- high quality primary and secondary education in science and mathematics is available to every child in the United States;
- those who select careers in science, mathematics, and engineering have available the best possible professional education in their disciplines;
- opportunities are available at the college level for interested non-specialists to broaden their science backgrounds; and
- sufficient support is available for science education outside the classroom in order to encourage and maintain public interest in, and awareness of, scientific and technological developments.

The roughly 600 TEP projects included in this evaluation reached an estimated 63,000 teachers from throughout the United States, at all school levels, and in a variety of communities. They have addressed the major subject areas of science and mathematics instruction. The TEP projects appear to have contributed to the larger order objectives of EHR.

12.2.3 The National Science Foundation

Finally, NSF has complementary educational objectives for its programs. Within this general framework, NSF seeks to leverage application of its resources and is strongly committed to the principal of cost sharing in its projects. Cost sharing among collaborating partners is strongly encouraged for all grant recipients -- especially where the goals include the continuation and maintenance of project activities by local institutions or self-sustaining networks after NSF funding has terminated. By achieving a 53 percent leverage (including both financial and in-kind contributions), the TEP projects have done especially well in this regard.

The Foundation also is especially concerned about the under-representation of women, minorities, and the physically disabled in careers in mathematics, engineering, and the sciences. Projects involving members of these groups as principal investigators or staff, and as the target population, are especially encouraged.

A large percentage of both PIs and participants respectively are female: 22.6 percent of all PIs and 57.4 percent of all participants.

The picture with respect to minority participation among TEP projects is not as encouraging. The incidence of PIs who are members of minority groups was low (5%). However, minority TEP PIs themselves did well in attracting minority applicants. Participation by minorities, according to self-reported minority status, was also with 7.9 percent of participants black, 1.7 percent Hispanic, and one percent native Americans or Pacific Islanders.

TEP has attracted PIs who have physical disabilities, with five percent reporting such disabilities. However, the number of TEP participants with such disabilities is lower -- with less than three percent of participants indicating that they had some form of physical disability.

12.3 Implications for Future TEP Policies and Programs

Recommendations derived from the surveys have been made with two objectives in mind. First, to suggest any improvements in the operation of the program itself that will, over the long run, further enhance its effectiveness. Second, to ensure that subsequent evaluation efforts will contribute the most policy- and program-relevant information to the staff of NSF. It is important to note that the recommendations presented in this report are based upon the responses to various questions posed to PIs and participants involved with TEP projects during the period between 1984 and 1989. In turn, these awards were operating under program guidelines issued for applications made during those fiscal years. Thus, these recommendations do *not* take into account changes in the TEP policies, program, and guidelines made in subsequent years. In the interim period, a number of changes, in fact, have been made. According to NSF officials, "since the time of this study, the program has nearly doubled in length of training and the teacher stipend; allows for 5-year projects; requires more evaluation and follow-up; requires administrative support in home institutions; and focuses more on leader teachers and district-wide system projects." In this sense, a number of recommendations in this report provide a form of external support to changes already made.

The following program and policy considerations arise from this study.

- TPE should emphasize that prospective grant applicants need to obtain commitments of non-NSF, financial, or in-kind support for their TEP projects. Aside from consistency with NSF policies, such support has demonstrable benefits, including: greater diversity of teaching methods (including computer-assisted instruction), development of curriculum materials, dissemination of curriculum materials, higher achievement of project goals, greater continuing use of other community scientific resources, longer term contact between PIs and participants, publication of journal articles, and continuation of support after completion of the TEP grant.

- TPE should carefully examine the program funding cycle to determine if it is possible to initiate requests for proposals under a schedule that would result in an earlier award date -- thus expanding the amount of recruitment time available to successful awardees.

- TPE may wish to examine the caseload of its program staff to insure that sufficient time is available for the provision of program support to TEP awardees.

- With respect to the funding cycle, three years appears to be appropriate. However, it may be useful to prepare a set of criteria for present awardees indicating specifically the conditions that must be met if a project is to receive an optional, two year follow-on. In this case, there are, of course, trade-offs between maintaining a truly superior project serving a significant number of participants, versus funding a new PI who has good ideas but is untried.

- The finding that TEP projects that concentrated their focus on more delimited subject matter and grade span (especially for kindergarten and early grade mathematics) were more highly rated by participants than some of the less delimited projects deserves some examination as this applies to grant application guidelines and in the screening of grant applications.

- It may be useful for TEP to determine the match between the location of the PIs (and the number and type of participants that they serve), and the distribution of school districts and various population groups. It would be especially important for NSF to know the extent to which there are significant mismatches between the location of school systems needing services and the location of PIs providing the services. One finding of this study appears especially important in this respect; female participants are less likely to be attracted to projects located far from their districts.

- TPE staff should consider steps that would increase the participation of PIs from under-represented groups. While the population of TEP awardees would appear to include reasonable numbers of individuals with physical disabilities, only one in five of TEP awardees is a woman, and (among awards where ethnicity or race is known), only one in ten are members of under-represented groups. (As a corollary, it is clear from the study results that PIs who are members of under-represented groups are notably effective in recruiting participants from these same groups.)

- Turning to under-represented groups of participants found in the TEP projects (as distinct from the PIs themselves), TPE staff should also make every effort to alert TEP PIs to the importance of **actively recruiting members of under-represented groups** in science and mathematics, particularly in any local school with a higher proportion of such persons among its faculty. It is clear that where PIs do target their recruiting to districts with under-represented groups, the level of such participation in the projects increases.

BIBLIOGRAPHY

BIBLIOGRAPHY OF TEACHER ENHANCEMENT PROGRAM PROJECT PUBLICATIONS, ARTICLES, AND NEWSPAPER ACCOUNTS

Articles and Publications

Baird, Bill. "Perspectives on Computer in Preservice Science Teacher Education." *SIGCUE Outlook.*

Baird, William E., Ellis, James D. and Kuerbis, Paul J. (1989) "ENLIST Micros: Training Science Teachers to Use Microcomputers." *Journal of Research in Science Teaching.* 26:7, pp. 587-598.

Bitter, Gary G. (ed.) (Fall 1990) "Software Reviews." *J. of Computers in Mathematics and Science Teaching.* 10:1, pp. 113-116.

Bray, Joan. (Winter 1990) "Lab Partners." *Washington.* Washington University Magazine, St. Louis, MO.

Carter, Betty. (September 1990) "Computer Software." *International Reading Association.* 34:1, p. 74-75.

Cole, Peggy R. (Spring 1988). "The Schooling of Museums: An NSF/Carnegie Science Curriculum Project." *A.A.M. Sourcebook.*

Cook, Cathy J. and Rasmussen, Claudette M. (August 1990) *Problem Solving and Critical Thinking in Mathematics and Science – A Professional Development Model.*

Crovello, Theodore J. and Ellis, James D. (1986) *Computers in Biology Education in the United States.* The IUBS Commission for Biological Education, Helsinki, Finland.

Ellis, James D. (1990) *ENLIST Micros: Phase III – Models for Establishing ENLIST Micros Teacher Centers.* Paper presented at the National Association for Research in Science Teaching at Atlanta, Georgia. 19 pages.

Ellis, James D. (1986) *Microcomputer Based Laboratories for Biology Education.* The IUBS Commission for Biological Education, Helsinki, Finland.

Ellis, James D. and Kuerbis, Paul J. (1984) "Educational Technology: A Force for Change." ***Redesigning Science/Technology Education.***

Ellis, James D. "The BSCS Perspective on Preparing Science Teachers in Educational Computing." ***SIGCUE Outlook.***

Ellis, James D. and Kuerbis, Paul J. (1986) "Computer Literacy for Science Teachers" in ***Becoming a Secondary School Science Teacher-Fourth Edition.*** Merrill Publishing Col., Columbus; pp. 150-153.

Ellis, James D. (April 1984) "A Rationale for Using Computers in Science Education." ***The American Biology Teacher.*** 46:4, pp. 200-206.

Ellis, James D. (Fall 1989) "An Evaluation of a Project for Preparing Science Teachers to Use Microcomputers." ***J. of Computers in Mathematics and Science Teaching.*** 9:1, pp. 51-64.

Ellis, James D. and Kuerbis, Paul J. (April 1988) "A Model for Implementing Microcomputers in Science Teaching." Presented at the Annual Meeting of the National Association for Research in Science Teaching at Lake of the Ozarks, Missouri.

Ellis, James D. (September 1989) "Enlist Micros". ***The Science Teacher.*** pp. 98-100.

Ellis, James D. (March 1991) "FAME -- Fellows for the Advancement of Mathematics Education." ***Mathematics Teacher.*** 84:3, p. 240.

Ellis, James D. (December 1989) "Family Math." ***Teaching Resources.*** City College, NY.

"Fellows for the Advancement of Mathematics Education (FAME)." (December 1989) ***Teaching Resources.*** City College, NY.

Gardner, Frank. (1986-1990) ***Program Report 1986-1990. Collaborative Institutes for Improving Science Literacy Among Elementary School Teachers.*** c/o New England Aquarium, Boston, MA.

Kisailus, Edward C. (1991). "Biology Interaction Group Partnership in Education (BIG/PIE)." Project Kaleidoscope. ***What Works: Building Natural Science Communities – A Plan for Strengthening Undergraduate Science and Mathematics.*** A National Colloquium, February 4 & 5, 1991, The National Academy of Sciences: Washington, D.C.

Kisailus, Edward and Marriott, Michele. (1988) "Strengthening Teaching Through Collaboration." ***IMPACT on Instructional Improvement – Collaborative Efforts.*** 22:1, p. 28-31.

Kramer, Pamela E. (1989) *NSF Summer Research Program for Secondary Science and Mathematics Teachers.* Brookhaven National Laboratory and Polytechnic University (Donald J. Metz -PI). 29 pages.

Krockover, Gerald H., Smith, David R., and Snow, John T. (August 1991) *Atmospheric Science Education Program for Teachers (Grades 5-12) – Developing Partnerships Between Schools, Colleges, and Governmental Agencies.* USA/USSR Joint Science Education Conference. Moscow, USSR. 6 pages.

Lawrenz, Frances and Kipnis, Naum. (Spring 1990) "Hands-On History of Physics." *Journal of Science Teacher Education.* 1:3, pp. 54-59.

Lindauer, Ivo E. and Christensen, John (eds.) (1989) *Cognition Applied to Science Teaching: Student Activities Sourcebook (and Teacher's Guide).* NSF/CAST Institute, Greeley, CO.

Malone, John, Burkhardt, Hugh, and Keitel, Christine (eds.) *The Mathematics Curriculum: Towards the Year 2000.* Curtin University of Technology, Perth, Western Australia.

Marek, Edmund A., Eubanks, Carol, and Gallaher, Thomas H. (1990) "Teachers' Understanding and the Use of the Learning Cycle." *Journal of Research in Science Teaching.* 27:9, pp. 821-834.

Marek, Edmund A. (April 1988) "A Memorable Trip for Science Teachers." *National Geographic.*

Michigan Earth Scientist. (Spring 1989) *Breaking the Mold: A New Purpose for an Old Radio Telescope.* XXV:2. The Earth Scientist: Lansing, MI.

Morey, Marilyn K. (1990) "Status of Science Education in Illinois Elementary Schools, 1987." *Journal of Research in Science Teaching.* 27:4, pp. 387-398.

National Association of Biology Teachers. *A Model Regional Leadership Consortium for Middle/Junior High School Life Science Teachers.* National Association of Biology Teachers: Reston, VA. 13 pages.

Oppenheimer, Steven B. (January 1987) "Advances in Cancer Biology." *The American Biology Teacher.* 49:1. pp. 11-15.

Oppenheimer, Steven B. (1988) "Antioncogenes." *The Science Teacher.*

Oppenheimer, Steven B. (November 1989) "Embryological Research." *The Science Teacher.* Vol. 56, pp. 40-43.

Oppenheimer, Steven B. (September 1989) "How-To-Do-It, The Sea Urchin Embryo: A Remarkable Classroom Tool." *The American Biology Teacher.* 51:6. pp. 354-357.

Oppenheimer, Steven B. (October 1987) "Ten Strategies for Cancer Prevention." *The Science Teacher.* Vol. 54. pp. 38-43.

Oppenheimer, Steven B. (January 1991) "Tumor Suppressor Genes: A Key to the Cancer Puzzle?" *The American Biology Teacher.* 53:1. pp. 22-24.

Oppenheimer, Steven B., Ellner, Carolyn L., and Hernandez, Luis F. (May 1987) "How Do You Get a Nobelist Into Your Classroom?" *The Science Teacher.* 54:5.

Oppenheimer, Steven B., Maxwell, Joyce B., and Allen, Larry G. (January 1988) "Advances in Biological Sciences." *The American Biology Teacher.* 50:1. pp. 18-22.

Orlich, Donald C. and Hannaford, Marion E. (Summer 1989) "Applying Temporary Systems Theory to Assess an Inservice Project." *Washington Science Teachers' Journal.* 29:3, pp 48-54.

Orlich, Donald C. and Hannaford, Marion. (December 15, 1986) **A Longitudinal Evaluation Strategy for Staff Development Programs.** Washington State University. A refereed paper presented at the National Staff Development Council Annual Conference, Atlanta, GA.

Orlich, Donald C. (March 1989) "Science Inquiry and the Commonplace." *Science and Children.* 26:6, pp. 22-24.

Price, Sabra, Knight, Deborah, and Hein, George E. (1988-1989) *Summary of Final Evaluation Report -- Museum Institute for Teaching Science 1988-1989.* c/o New England Aquarium, Boston, MA.

Schneider, Cary and Alan Friedman. (1988). "POPS Revisited". **The Planetarian.**

Science/Engineering Education Division, Oak Ridge Associated Universities. (1991) *Science researchers research involvement for vital education (STRIVE) regional replication. Summary of Activities, 1990.* 20 pages.

Science is Elementary -- A Science Teaching Resource Publication. 4:2. c/o New England Aquarium, Boston, MA.

Scott, Frederick I. (August 1988) Editorial -- A High School Science Research Program." *American Laboratory.*

Seligmann, P. and Spencer, C.D. "Computer Applications in the Secondary Science Laboratory." Submitted to *The Physics Teacher.*

Seligmann, Peter F. and Steven R. Thompson. (November/December 1989) "How-To-Do-It, Using Computers in Measuring Transpiration Rate." *The American Biology Teacher.* 51:8. pp. 494-496.

Simon, Martin A. and Deborah Schifter. (1991). "Toward A Constructivist Perspective: An Intervention Study of Mathematics Teacher Development." (in press) **Educational Studies in Mathematics**

Smith, Claire. (Summer 1986) "Helping the State of Chemistry Teaching in the State of California." *CST Journal.*

South Carolina Professional Development Program for Science and Mathematics Teachers. (January 31, 1990) *Final Report.* Excerpts.

Spain, James D. and Ellis, James D. (eds.) "The BSCS and Educational Computing in the Sciences." *The American Biology Teacher.* 48:2.

Taylor, Beverley A.P., Williams, John P., Sarquis, Jerry L., and Poth, James. (Fall 1990) "Teaching Science with Toys: A Model Program for Inservice Teacher Enhancement." *Journal of Science Teacher Education.*

Thompson, Steven R. and Seligmann, Peter. (January 1991) "Squirt-Gun Scattering." *The Physics Teacher.* p. 62-63.

Thompson, Steven R., Seligmann, Peter F. and Cava, F.J. "A pH and Computer Approach to Measuring Respiration Rate." Submitted to *American Biology Teacher.*

The Vortex. (October 1985) *NSF Grant Awarded for Section Teacher Training Project.* The American Chemical Society, XLVI:8.

Newspaper and Newsletter Accounts

Accent on Mathematics and Engineering & Science in Southern Arizona. (Dec. 1989) "PRISM: Promoting Reasoning in School Mathematics."

The Advertiser-Tribune. (April 14, 1989). "Ocean Focus." Tiffin, Ohio.

The Albany Herald. (March 12, 1988) "Grant to Aid Area Teachers." Albany, Georgia.

The Albany Sunday Herald. (April 16, 1989) "Seminars." Albany, Georgia.

The Albany Sunday Herald. (August 5, 1990) "Must Expect Excellence, Science Teachers are Told." Albany, Georgia.

American Association of State Colleges and Universities. (November 3, 1989) "Grants and Gifts." 29:35.

Arizona Report. (Spring, 1990) "High tech math for teachers."

The Beacon. (September 21, 1989) "P.C.H.S. Teacher Participates in "Ocean Focus" Program at BGSU." Port Clinton, Ohio.

The BG News. (June 5, 1991) "Course assists science teaching." Bowling Green, Ohio. 73:120.

The Blade. (March 27, 1991) "Pupils going the marine route." Toledo, Ohio.

Blade Weekly. (February 21, 1989) "In The Schools."

Bryan Times. (February 1989) "Local teacher takes part in ocean study."

Butler Eagle. (January 1, 1990) "Chem van boosts science interest."

Catholic Accent. (June 26, 1986) "Teachers Participate in Honors Program", Greensburg, PA.

The Charleston Gazette. (September 22, 1987) "Students to get hands on radiotelescopes." Charleston, WV.

The Charleston Gazette. (July 16, 1987) "Science campers keep vigil to listen for stars." Charleston, WV.

Clayton Citizen Journal. (November 24, 1988) "Grant to benefit science students." Creve Coeur, MO.

Clayton Citizen Journal. (January 4, 1989) "School superintendents plan their improvements for '89." Creve Coeur, MO.

The Clyde Enterprise. (September 26, 1990) "C-GS teachers treated to up-close ocean experience."

Columbus Ledger-Enquirer. (December 1988) "Braski hopes to turn kids on to science."

The Continuing Educator. (Fall 1990) "New Focus for Continuing Education." II:1.

Continuum. (Fall 1989) "Heat." PATHS/PRISM: Philadelphia, PA.

Continuum. (Fall/Winter 1990-91) "Heat, Light and Motion." PATHS/PRISM: Philadelphia, PA.

The Daily Mail. (August 4, 1989) "Things Looking Up for Martin." Hagerstown, MD.

The Daily News. (October 10, 1989) "Juniata Science Program Earns National Recognition." Hungtingdon, PA.

The Daily Report. (August 11, 1989) "Goal is better physics teaching."

Daily Star-Progress. (June 21, 1989) "Physics Institute to open at CSF."

Daily Tribune. (July 27, 1989) "Universities launch study on physics." West Covina, CA.

The Detroit News. (April 15, 1991) "Grosse Point students are the stars after a science 1st." Detroit, Michigan.

The Detroit News. (June 13, 1990) "Eyes on the skies -- Students build radio telescope to monitor the universe."

Durham Morning Herald. (November 18, 1984) "Geography Department Schedules Workshop on Energy Education." Durham, NC.

The Eagle's Eye. (January 30, 1989) "Biology Teachers to Provide Saltwater Experience for Advanced Science Students." Eastwood High School.

The Eagle's Eye. (March 22, 1991) "Students in New Marine Science Course Preparing for Their Days in the Sunshine." Eastwood High School, XXXII:7.

Electric Quarterly. (Summer 1989) "Electricity and Life." 11:3. The Bakken, Minneapolis, MN.

Electric Quarterly. (Fall 1990) "Is Seeing Believing?" 12:4. The Bakken, Minneapolis, MN.

Fairfield Echo, Journal News. (June 29, 1988) "Science has its place in the toy box." Fairfield, OH.

Griffith Observer. (March 1990) "Adventures of a Participant in the 1988 Radio Astronomy Summer Institute." The Griffith Observatory, Los Angeles, CA.

Grosse Point News. (May 24, 1990) "Students build radio telescope -- for fun." Grosse Pointe, Michigan. 51:21.

The Herald-Dispatch. (September 23, 1987) "W.Va. students look to the stars." Huntington, WV.

Herald Examiner. (July 17, 1989) "Colleges seek to improve high school physics classes." Los Angeles, CA.

The Independent Observer. (July 10, 1985). "Local Teachers Selected for SVC Honors Program." Scotsdale, PA.

Innovation. (Award-Winning Projects 1989) "Merck Innovation Awards in Undergraduate Science Education."

The Inter-Mountain. (December 22, 1989) "Pocahontas High School Teacher, Student Chosen for NASA Project." Elkins, WV.

The Jeannette Spirit. (July 10, 1985) "Biondi Selected to Prestigious Program." Jeannette, PA.

The Journal-News. (March 29, 1989) "Miami offers stats course."

The Journal-News. (April 18, 1987) "Kids get the answer to 'Why'?"

The Ligonia. (July 2, 1986) "Three Area Teachers Participating in Honors Program at St. Vincent." Ligonia, PA.

Los Angeles Times. (June 27, 1987) "Biology Class Breathes New Life Into Science for Teachers." Los Angeles, CA.

Los Angeles Times. (May 25, 1989) "Physics Program to Aid High School Instructors." Los Angeles, CA.

Los Angeles Times. (August 2, 1989) "2 universities help teachers teach physics." Los Angeles, CA.

Marana Unified School District Newsletter. (Sept. 1990) "PRISM Program puts focus on problems."

Monitor (Bowling Green State University). (October 3, 1988) "Diving into Science: Sea Life Focus of Class." XII:14.

Mount Pleasant Journal. "Ramsay Teacher Selected for Honors Program at SVC". Mt. Pleasant, PA.

The New York Times. (January 7, 1990) "High Hopes -- Teamwork and tools remake a teen-age spectator sport." New York, NY.

The News and Observer. (October 20, 1988) "NCCU Receives Grant for Teacher Education." Durham, NC.

News Herald. (February 14, 1989). "Local teachers joining 'Ocean Focus' program."

News Herald. (September 27, 1989) "Port Clinton High has saltwater aquarium." Port Clinton, Ohio.

Northwest Signal. (February 1989) "Three area teachers to dive for sea urchins."

The Observer, A Newsletter of The Tri-State Astronomers. (May 1991) "A Science Project at NRAO." 7:5.

Orange County Business Journal. (June 19, 1989) "Corporate Notes."

Penn Franklin News. (July 15, 1985) "Franklin Teachers Selected for Honors Program at Saint Vincent College." Murrysville, PA.

The Pocahontas Times. (1990) "NRAO & the nation's teachers invite you!"

The Post. (August 22, 1988) "Science Project -- Putting the fun in the lab."

Post Dispatch. (November 23, 1990) "Make Science a Magnet for Minorities." St. Louis, MO.

Post Dispatch. (March 4, 1991) "Science SEERS: Students Find Hands-on Study Fulfilling." St. Louis, MO.

Post Dispatch. (May 25, 1991) "Hands-On Science is a Learning Experience." St. Louis, MO.

Press-Telegram. (July 17, 1989) "Schools win science grant."

Review Times. (February 11, 1989). "Local and area teachers enhancing science skills." Fostoria, Ohio.

Purdue University Perspective. (Spring 1991) "Science takes flight with road show."

San Jose State University Newspaper. (July 1985) "Chemistry teachers go back to school."

The Satellite. (February 1989). "Texans Investigate the Universe." Official Newsletter of the Science Teachers Association of Texas. 32:1. page 30.

School District of University City. (February 15, 1991) "University City Schools Recognize Science Celebration Day." University City, MO.

Spacewatch. (June 1989) "Pilot program hosts 10 Texas teachers." 6:6.

Star Tribune. (July 26, 1990) "'N-ray' will be her tool in teaching."

Stateline. (September 1989) "Pomona." (excerpt about NSF grant) The California State University.

SESCN Networking. (June 1991) "Who is a Scientist? I Guess We All Are!" II:12.

SESCN Networking. (April 1991) "NSF Funding Gains Over 1990 – K-12 & Higher Ed Eisenhower Grants Up." II:11.

SESCN Networking. (February 1991) "Who is A Scientist Poster Contest Fosters Science-Related Career Opportunities for All Students." II:10.

SESCN Networking. (December 1990). "SESC Network Participants in British-American-African-Australian Science Exchange Program." II:9.

SESCN Networking. (October 1990). "SESC Network 5th Annual Conference Hear Head of Project 2061, Collaborate with Other Curriculum-Influencing Special Topics Groups." 4:1.

SESCN Networking. (February 1990). "What Do Teachers Say About SESC?" II:4.

SESCN Networking. (March 1990). "SESC 1990-91 Advisory Council Discusses the Formation of Partnerships." II:5.

SESCN Networking. (April-May 1990). "UW-Green Bay SESC Teachers Study Animal and Plant Reproductive Biology." II:6.

SESCN Networking. (January 1990). "Simple Ingredients Plus Hands-on Experiments by Stevens Point Area Inservice Teachers Make K-6 Classroom Science Education Lessons." II:3.

SESCN Networking. (December 1989). "Milwaukee SESC Participants Take Biology Field Trip to Milwaukee Public Museum and River Edge Nature Preserve." II:2.

SESCN Networking. (November 1989). "New Centers, New Classes, Net Network Coordinator." II:1.

SESC Newsletter. (July 1989). "Statewide Network Funded -- Almost $1 M to New Project from NSF." I:8.

SESC Newsletter. (March 1989). "SESC & EESA Plan Joint Conference in Madison June 8-9, 1989 on Collaborative Relationships." I:7.

SESC Newsletter. (January 1989). "SESC Statewide Network Funded by NSF."

SESC Newsletter. (December 1988). "Wayne Welch Takes NSF Post." I:6.

SESC Newsletter. (Fall 1988). "Shakhashiri Keynotes Project Workshop." I:5.

SESC Newsletter. (Summer 1988). "SESC Staff and Council Members Receive EESA Funding." I:4.

SESC Newsletter. (Fall 1987). "How Did We Get Started."

SESC Newsletter. (Fall 1987). "SESC Project Begins Second Year." I:3.

SESC Newsletter. (Summer 1987). "Wayne Welch Evaluates Science Education Service Centers Project." I:2.

SESC Newsletter. (Winter 1986/87). "Welcome to the SESC Newsletter." I:1.

The Sentinel. (April 12, 1991) "Three area students place in science fair." Huntingdon, PA.

Sentinal-Tribune. (June 1988) "Education -- Marine Biology Program for 40 Teachers." Bowling Green, Ohio.

Sentinal-Tribune. (February 10, 1989) "Education -- The Ocean is Focus of BGSU Program." Bowling Green, Ohio.

Sentinel-Tribune. (July 8, 1989). "Class goes to Florida for ocean experience." Bowling Green, Ohio.

Sentinel-Tribune. (September 9, 1989) "Ocean biology class impacts on grade 2." Bowling Green, Ohio.

Sentinel-Tribune. (October 10, 1990) "BGJHS teacher helps BGSU Teaching Ocean Focus Course." Bowling Green, Ohio.

Sentinel-Tribune. (November 1990) "Children study 'chunk of ocean in three of Milton's classrooms." Bowling Green, Ohio.

Sentinel-Tribune. (November 1, 1990). "3 BGSU faculty members honored." Bowling Green, Ohio.

Sentinel-Tribune. (March 15, 1991). "BGSU receives third NSF grant."

Sentinel-Tribune. (March 12, 1991). "Ocean Focus in final year."

Sentinel-Tribune. (May 6, 1991). ""Eastwood class explores the ocean." Bowling Green, Ohio."

Sentinel-Tribune. (May 9, 1991). "Eastwood students & teachers in marine science class praised." Bowling Green, Ohio.

Tiffin City Schools. (1989) "Ocean Focus."

Tribune-Review. (July 7, 1985). "Mt. Pleasant Teacher Chosen for Honors Program." Mt. Pleasant, PA.

U.City. (January 1989) "University City Schools Receive National Science Foundation Grant of $640,000." University City, MO.

U.City. (October/November 1989) "Equity Monies Needed for Project SEER." University City, MO.

University of Arizona Faculty-Staff News. (Aug. 29, 1990) "Aha! Teachers learn how to help students experience thrill of discovery using problem solving principles, computers and new lesson plans."

University of Arizona Faculty-Staff News. (Oct. 16, 1989) "PRISM aim to reverse slipping math skills."

University City Schools News. (November 22, 1988) "School District of University City Receives National Science Foundation Grant.."

USA Today. (May 15, 1991) "Van takes chemistry lessons on the road."

Weekly Blade. Toledo. Excerpt about Mr. Dishong, seventh grade teacher at Springfield Junior High School.

The West Virginia Daily News. (August 14, 1987) "Science Teachers at Observatory for Workshop."

The Wichita Eagle-Beacon. (August 25, 1985) Excerpt about teachers at National Science Foundation science institute. Wichita, KS.

The Wichita Eagle-Beacon. (July 13, 1985) "Teachers' 'Vacation' Is Time for Learning." Wichita, KS.

APPENDIX A

TEP PARTICIPANT QUESTIONNAIRE

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

OMB No.: 3145-0127
Approval Expires: 1 Nov 1992

A SURVEY OF

TEACHERS WHO PARTICIPATED IN THE NSF TEACHER ENHANCEMENT PROGRAM

1984-1989

Participant Label

Privacy Act and Public Burden Statements. The information requested in the survey is solicited under the authority of the National Science Foundation Act of 1950, as amended. It will be used for overall TEP program assessment purposes. Data about individual projects will be available to NSF staff members only on a "need to know" basis for their official duties. Submission of the requested information is voluntary.

The reporting burden for this survey is estimated to average 35 minutes of your time. Send comments regarding this burden estimate or any other aspect of the collection of information, including suggestions for reducing this burden to:

Herman G. Fleming, Reports Clearance Officer
Division of Personnel and Management
National Science Foundation
Washington, D.C. 20550

and to:

Office of Management and Budget
Paperwork Reduction Project (3145-0121)
Washington, D.C. 20503

INFORMATION FOR COMPLETING SURVEY

PLEASE READ THESE INSTRUCTIONS

1. This survey of teachers who participated in the **Teacher Enhancement Program** of the National Science Foundation is being conducted by the Office of Studies, Evaluation and Dissemination of the Directorate for Education and Human Resources.

2. The identifying label placed on the survey cover serves two purposes:

    a. The label identifies the specific project about which you are responding;

    b. The label permits us to keep track of returned forms, in order to remind those individually who have not yet completed the survey to do so promptly.

3. If you participated in more than one Teacher Enhancement Project, you may receive more than one survey form. Please answer the questions in this survey form in terms of the project specified on the cover of this questionnaire. If you are uncertain about the exact answer to any question, please provide your best estimate.

4. If you are **no longer a teacher**, please respond to this form as of your **last year in teaching**.

5. While this survey is formatted to require as little of your time as possible, we have asked for a limited number of written comments. NSF is very interested in your opinions about these topics, particularly in your assessment of what went well in your project, and what needed improvement.

6. If you have questions about the survey or about individual items, please call Diane Stoner, toll-free at **1-800_777_6492**.

Please return your completed questionnaire in the postage paid envelope to:

TEP Participants Survey
Abt Associates Inc.
55 Wheeler Street
Cambridge, MA 02138

IF POSSIBLE, PLEASE FILL IN THE SURVEY WITHIN THE NEXT TEN (10) DAYS

Your TEP Project Application and Goals

1. How did you learn about the opportunity to participate in the TEP Project? **(Circle all that apply.)**

Procedure

a.	Received announcement through local school district.	1
b.	Received announcement through local teacher organization.	2
c.	Received announcement through a special interest organization or advocacy group.	3
d.	Heard about it from another teacher, my school principal or other school administrator	4
e.	Read about it in professional journal or newsletter.	5
f.	Read about it in local newspapers, or heard of it on local radio station.	6
g.	The TEP Project Director visited my school.	7
h.	The TEP Project Director made personal contact with me.	8
i.	Other (Specify): ______________________	9

2A. How important were each of the following emphases or goals in your decision to participate in the TEP project? (Please assign higher values only to those statements below that were clearly major objectives of yours.) **(Circle one number for each item.)**

	Not Important		Moderately Important		Very Important
Subject Matter Understanding					
a. To improve my knowledge of science and/or mathematics content.	0	1	2	3	4
b. To increase my knowledge of the applications of science and/or mathematics principles.	0	1	2	3	4
c. To increase my knowledge of "cutting-edge" research in science and/or mathematics.	0	1	2	3	4
Pedagogical Practice					
d. To develop ways to enhance my students' interest in science and/or mathematics.	0	1	2	3	4
e. To learn new ways to motivate female, minority, or disabled students toward greater achievement in science and/or mathematics.	0	1	2	3	4

(Circle one number for each item.)

Pedagogical Practice (cont.)		Not Important		Moderately Important		Very Important
f.	To develop additional teaching skills for improving students' problem-solving or critical thinking abilities.	0	1	2	3	4
g.	To develop or refine effective teaching materials.	0	1	2	3	4
h.	To gain experience with "hands-on" activities in science and/or mathematics.	0	1	2	3	4
i.	To develop ways to integrate science and/or mathematics instruction with one another.	0	1	2	3	4
j.	To develop ways to integrate science and/or mathematics instruction with other subjects.	0	1	2	3	4
General Professional Development						
k.	To learn how to update teaching practices continuously to take into account new methods and course contents.	0	1	2	3	4
l.	To develop abilities to lead local in-service teacher training programs.	0	1	2	3	4
m.	To develop abilities to work with other scientific and/or mathematics resources (e.g., colleges, museums, zoos).	0	1	2	3	4
n.	To earn continuing education credits.	0	1	2	3	4
o.	To earn credits toward a graduate degree.	0	1	2	3	4
p.	Other major emphasis or goal (for subject matter understanding, pedagogical practice, or general professional development) (Specify:) ____________________	0	1	2	3	4

2.B Please write the letters corresponding to the three goals (a through p above) that you felt were most important to you.

1.________ 2.________ 3.________

Describing Your TEP Project

3. Please indicate below:

A. Whether you attended the TEP project during the time period listed (***Column A***), if so,

B. Please provide the more detailed information requested (***Column B***).

Did you attend. . .	A. YES	A. NO	B. IF YES:
A summer program	1	2	
For how many weeks?			______ weeks
For your first summer, approximately how many total contact hours did you have with TEP faculty?			______ hours
During the school year	1	2	
Approximately how many project sessions or meetings did you attend?			______ sessions
During the school year, approximately how many contact hours did you have with TEP faculty (including all sessions and meetings)?			______ hours
Subsequent summer program(s)	1	2	
For how many weeks?			______ weeks
During the subsequent summer program(s), approximately how many contact hours did you have with TEP faculty?			______ hours
Post-summer independent study	1	2	
Approximately how many hours of independent study did you spend?			______ hours

4. Which content areas received **major emphasis** in your project? **(Circle all that apply)**

Mathematics

a. Arithmetic, computations . . . 1

b. Arithmetic, problem-solving . 2

c. Geometry 3

d. Algebra 4

e. Discrete mathematics 5

f. Advanced math (e.g., calculus) . . 6

g. Probability/statistics/data analysis . 7

h. Computer science or programming 8

i. Use of computers in mathematics . 9

j. Other Math (Specify): __________10

Science (Circle all that apply)

k.	Astronomy	11
l.	Atmospheric Sciences	12
m.	Biochemistry	13
n.	Biological Sciences	14
o.	Behavioral Sciences	15
p.	Chemistry	16
q.	Computer Sciences	17
r.	Geology	18
s.	Engineering	19
t.	Information Science	20
u.	Material Sciences	22
v.	Oceanography	23
w.	Physics	24
x.	Social Sciences	25
y.	Philosophy or history of science	26
z.	Interdisciplinary science	27
aa.	Science, Technology & Society	28
bb.	Other (Specify): ____________	29

5. For the Teacher Enhancement project you attended, please estimate approximately what percent of the project's time was spent in each of the following instructional methods:

(Percent of Time Used in Project)

a. Lecture / recitation ______

b. Laboratory work, "manipulatives' or other hands-on activity ______

c. Other (Specify): ______________________________ ______

Should Sum to 100%

Assessment of Your TEP Project

6. Please indicate how often each of the following instructional methods or materials was used in the project you attended. For **each category used (i.e., where you circle B or C)**, please also indicate your assessment of its effectiveness as a teaching devise in that context.

	(Circle one letter)			(If B or C circled, please rate)				
Methods/Materials	**Not Used**	**Used Some**	**Used Often**	**Ineffective**		**Moderately Effective**		**Very Effective**
a. Lecture.	A	B	C	0	1	2	3	4
b. Small group discussion.	A	B	C	0	1	2	3	4
c. Instructor demonstrations.	A	B	C	0	1	2	3	4
d. Participant hands-on activities.	A	B	C	0	1	2	3	4
e. Cooperative learning groups.	A	B	C	0	1	2	3	4
f. Computer assisted instruction.	A	B	C	0	1	2	3	4
g. Computer models, simulations, or games.	A	B	C	0	1	2	3	4
h. Noncomputerized games or role playing.	A	B	C	0	1	2	3	4

Methods/Materials	Not Used	Used Some	Used Often	Ineffective		Moderately Effective		Very Effective
	(Circle one letter)			(If B or C circled, please rate)				
i. Viewing films/videos.	A	B	C	0	1	2	3	4
j. Library research.	A	B	C	0	1	2	3	4
k. Use of resource people.	A	B	C	0	1	2	3	4
l. Field trips.	A	B	C	0	1	2	3	4
m. Examining instructional resources.	A	B	C	0	1	2	3	4
n. Peer teaching.	A	B	C	0	1	2	3	4
o. Other (Specify): ____________	A	B	C	0	1	2	3	4
p. Other (Specify): ____________	A	B	C	0	1	2	3	4

7. How would you rate the Teacher Enhancement Project, named on the label on the cover, on each of the following items.

	Poor		Good		Excellent
a. The relevance of the content or subject matter to your teaching assignments.	1	2	3	4	5
b. The knowledge of the staff members in the content area or subject matter.	1	2	3	4	5
c. The knowledge of staff members about schools and teaching.	1	2	3	4	5
d. The quality of printed materials (textbooks, handouts, etc.) used.	1	2	3	4	5
e. The extent to which labs and other hands-on activities were clear and easy to understand.	1	2	3	4	5
f. The usefulness of laboratory or other hands-on activities to your classroom situation.	1	2	3	4	5
g. The adequacy of lab space and other facilities for conducting the program.	1	2	3	4	5
h. The responsiveness of staff members in working with participants.	1	2	3	4	5
i. The overall quality of the program.	1	2	3	4	5

8. To what extent does each statement below describe your feelings about **this project and or its results? Please use the scale below, on which:**

0 = Not true
1 = Seldom true
2 = Somewhat or sometimes true
3 = Often true
4 = Very true
DK = I don't know

(Circle one answer for each item)

a.	I improved my knowledge of science and/or mathematics content.	0	1	2	3	4	DK
b.	I increased my knowledge of the applications of science and/or mathematics principles.	0	1	2	3	4	DK
c.	I increased my knowledge of "cutting-edge" research in science and/or mathematics.	0	1	2	3	4	DK
d.	I increased my abilities to enhance students' interest in science and/or mathematics.	0	1	2	3	4	DK
e.	I learned new ways to motivate female, minority, or disabled students toward greater achievement in science and/or mathematics.	0	1	2	3	4	DK
f.	I developed additional skills for improving students' problem-solving or critical thinking abilities.	0	1	2	3	4	DK
g.	I increased my knowledge of sources or types of teaching materials.	0	1	2	3	4	DK
h.	I used materials or lessons in my classrooms that I **learned about** in the TEP project.	0	1	2	3	4	DK
i.	I used new materials or lessons in my classroom that were **developed** within the TEP sessions.	0	1	2	3	4	DK
j.	I improved my ability to help students gain experience with "hands-on" activities.	0	1	2	3	4	DK
k.	I developed ways to integrate science and/or mathematics instruction with one another.	0	1	2	3	4	DK

(Circle one answer for each item)

l.	I developed ways to integrate science and/or mathematics instruction with other subjects.	0	1	2	3	4	DK
m.	I learned how to update my teaching practices continuously in order to take into account new methods and course contents.	0	1	2	3	4	DK
n.	I disseminated methods or materials from the TEP project by leading in-service sessions in my district or school system.	0	1	2	3	4	DK
o.	I gave presentations about the TEP project at professional meetings.	0	1	2	3	4	DK
p.	I served as a TEP staff member or mentor in later years of the project, or in other similar projects.	0	1	2	3	4	DK
q.	I remained in contact with other participants after the project to discuss teaching strategies or methods.	0	1	2	3	4	DK
r.	I remained in contact with TEP project staff.	0	1	2	3	4	DK
s.	I established working partnerships with local science and/or mathematics resources (e.g., a college, museum, zoo,).	0	1	2	3	4	DK
t.	I learned a lot from working with other teachers.	0	1	2	3	4	DK
u.	I would strongly recommend my TEP experience to another teacher.	0	1	2	3	4	DK
v.	Other (Specify): ______________________	0	1	2	3	4	DK

9A. Since you attended the TEP project have you personally established a working partnership with other science or mathametics institutional resources, or persons in such institutions?

YES 1
NO **(SKIP TO Q. 10)** 2

9B. With what types of institutions? **(Circle all that apply)**

a.	College or University faculty members in **mathematics or computer science**	1
b.	College or University faculty members in **science**	2
c.	College or University faculty members in **education** school or department	3
d.	Federally funded R&D laboratory staff	4
e.	Federal government agency staff	5
f.	State government agency staff	6
g.	Local government agency staff	7
h.	Foundation staff	8
i.	Museum staff	9
j.	Zoo staff	10
k.	Other non-profit organization staff	11
l.	Persons from private industry	12
m.	Other type (Specify): ______________________	13

Your Science or Math Teaching **(If you have not taught at all since your participation in the TEP project, SKIP TO Q.11)**

10A. Since your participation in the TEP project, have you kept the **same level, increased** or **decreased** any of the following activities as compared to what occurred before your participation in TEP? For each activity that has **increased** or **decreased (i.e., where you circle B or C)**, please also indicate the extent to which your TEP participation contributed to this change. (**NOTE**: If you are not presently teaching, please provide answers for your most recent year of teaching following your TEP project.)

	(Circle one letter) Since TEP, this activity:			**(If B or C circled, please rate) My TEP Participation had:**				
Methods/Materials	**Is the Same**	**Has Incrsd**	**Has Decrsd**	**No Impact**		**Moderate Impact**		**Major Impact**
a. Have students work in small groups.	A	B	C	0	1	2	3	4
b. Integrate applications of science and/or math into teaching.	A	B	C	0	1	2	3	4
c. Provide students with hands-on laboratory experiences.	A	B	C	0	1	2	3	4
d. Use calculators in the classroom.	A	B	C	0	1	2	3	4
e. Use computers in the classroom.	A	B	C	0	1	2	3	4
f. Have students read textbooks in class.	A	B	C	0	1	2	3	4

	(Circle one letter) Since TEP, this activity:			(If B or C circled, please rate) My TEP Participation had:				
Methods/Materials	Is the Same	Has Incrsd	Has Decrsd	No Impact		Moderate Impact		Major Impact
g. Have science/math lessons outside the school building.	A	B	C	0	1	2	3	4
h. Conduct scientific demonstrations for students.	A	B	C	0	1	2	3	4
i. Give lectures to a whole class.	A	B	C	0	1	2	3	4
j. Bring guest speakers into class.	A	B	C	0	1	2	3	4
k. Conduct discussions with class.	A	B	C	0	1	2	3	4
l. Use a variety of testing formats and styles.	A	B	C	0	1	2	3	4
m. Help students find answers to their own questions.	A	B	C	0	1	2	3	4
n. Provide students with the opportunities to guide their own learning.	A	B	C	0	1	2	3	4

10B. Since your participation in the TEP project, do you believe that your students have **maintained the same level, increased**, or **decreased** on any of the following characteristics? **For each** student characteristic that **increased** or **decreased (i.e., where you circle B or C), please also** estimate the extent to which you believe that changes in your teaching activities that **resulted from TEP participation** contributed to this change. (**NOTE**: If you are no longer teaching at the same school as before your participation in the TEP project, **SKIP TO Q. 11.**)

	(Circle one letter) Since TEP, my students:			(If B or C circled, please rate) My TEP Participation had:				
Student Characteristics	Is the Same	Has Incrsd	Has Decrsd	No Impact		Moderate Impact		Major Impact
a. Level of interest/enthusiasm in class for science or mathematics.	A	B	C	0	1	2	3	4
b. Learning as reflected in classroom test scores.	A	B	C	0	1	2	3	4
c. Enrollment in advanced courses.	A	B	C	0	1	2	3	4
d. Involvement in science or mathematics projects outside of class.	A	B	C	0	1	2	3	4
e. Participation in science fairs or contests.	A	B	C	0	1	2	3	4
f. Learning as reflected in standardized test scores.	A	B	C	0	1	2	3	4
g. Selection of a science, mathematics or engineering major in college.	A	B	C	0	1	2	3	4
h. Interest in science, mathematics or engineering as a career.	A	B	C	0	1	2	3	4

Follow up Activities

11. Some of the projects funded by this program are intended to develop "lead teachers" or mentors who work with other math and science teachers. We are interested in your role in working with other teachers since you participated in the Teacher Enhancement Project named on the cover. For each of the activities listed below:

In column **A**, indicate each activity that you had done before attending this project.

In column **B**, indicate each activity that you have done since attending the project.

In column **C**, please estimate the number of teachers who attended or participated in the activity since you attended this Teacher Enhancement Project (unless an "X" appears on the list).

	In columns **A and B, Circle all that apply**	**A.** **Before TEP**	**B.** **Since TEP**	**C.** **Number of Teachers Since TEP**
a.	Made presentations about science and/or mathematics to other teachers **within** my school.	1	1	________
b.	Made presentations about science and/or mathematics to other teachers **outside** of my school.	2	2	________
c.	Served as an informal mentor or advisor to other teachers **within** my school.	3	3	________
d.	Served as an informal mentor or advisor to other teachers **outside** my school.	4	4	________
e.	Organized a workshop or other in-service activity, **within** my school, of one day or more in length.	6	6	________
f.	Organized a workshop or other in-service activity, **outside** of my school, of one day or more in length.	6	6	________
g.	Made a presentation at a professional meeting for science and/or mathematics teachers.	7	7	________
h.	Served as a staff member in a summer professional development program for science and/or mathematics teachers.	8	8	________
i.	Appointed formally as a science and/or mathematics team leader, department chair, or mentor within my school.	5	5	X
j.	Wrote for professional publications in science and/or mathematics teaching.	9	9	X
k.	Used a computer network to maintain contacts with colleagues in science and/or mathematics teaching.	10	10	X
l.	Contacted someone at a college or university about my science and/or mathematics teaching.	11	11	X
m.	Contacted members of the local business community to get them involved in supporting science and/or mathematics education.	12	12	X
n.	Other similar type of activity? Please specify below:	13	13	X

____

District or School System Support

12. Please indicate to what extent you feel that each statement below is true for your school district or its policies. **(Circle one number for each item)**

		Not At All True		Somewhat True		Very True	Don't Know
a.	My school system has a comprehensive plan to improve science and/or mathematics instruction.	0	1	2	3	4	DK
b.	Administrators encourage teachers to use hands-on methods in science and/or mathematics classes.	0	1	2	3	4	DK
c.	I have a lot of flexibility to choose the topics covered in the courses I teach.	0	1	2	3	4	DK
d.	I have the materials and other resources I need to use hands-on methods when teaching math or science.	0	1	2	3	4	DK
e.	The principal of my school actively supports improved methods of science and/or mathematics teaching.	0	1	2	3	4	DK
f.	The school system strongly encouraged me to attend the TEP project.	0	1	2	3	4	DK
g.	The school system provided or obtained financial support for me to attend the TEP project.	0	1	2	3	4	DK
h.	My home school district has provided adequate support for using the content or methods I learned in my TEP project.	0	1	2	3	4	DK
i.	When I lead in-service activities for other teachers based upon my TEP experience, I have release time from my regular teaching load.	0	1	2	3	4	DK
j.	When I lead in-service activities for other teachers based upon my TEP experience, there is an adequate budget for materials and supplies.	0	1	2	3	4	DK

Your Career and Teaching Activities at the Time You Began the TEP Project

13. At the time you first enrolled in the TEP project, were you employed as a teacher?

YES 1
NO **(SKIP TO Q. 19)** 2

14. How many years of teaching experience had you had at that time?

Years: ___________

15. At what grade level(s) were you teaching? **(Circle all applicable grades)**

K 1 2 3 4 5 6 7 8 9 10 11 12

Other (Specify): ____________________

16. What proportion of a typical work week was spent teaching each of the following subjects and on non-teaching activities? Please be sure that the numbers you enter total to 100% of your working time.

Self-contained class that included all Mathematics and Science Subjects ________%
Mathematics ________%
General or Physical Science ________%
Biology ________%
Chemistry ________%
Physics ________%
Earth, Ocean or Atmospheric Science ________%
Ecological or Environmental Sciences ________%
Geography ________%
Computer Science ________%
Health Science ________%
Other Science (Specify): ____________________ ________%
Social Studies ________%
Administration (e.g., department chair) ________%
Non-Science or Math Subjects ________%
Non-Teaching Activity (e.g., study hall, counseling) ________%

Should Sum to 100%

17. Which of the following best describes your teaching status at the time you enrolled in the TEP project?

(Circle all that apply)

Pre-service teacher 1
In-service teacher (under-prepared for science and/or mathematics) 2
In-service teacher (well-prepared for science and/or mathematics) 3
Teacher expected to assume leadership position in your **school** or **district** (e.g., "resource," "leader," "master," or "mentor" teacher) 4
Teacher expected to assume leadership positions at the **state** or **national** level. 5
Other (Specify): ____________________ 6

18. What were the characteristics of the school where you were teaching at the time you enrolled in the TEP? **(Please circle one each)**

A. Location:

City 1
Suburban 2
Rural 3

B. Type:

Public 1
Private 2
Mixed 2

C. Approximate **percentage** of students in this school eligible for **reduced price or free school lunches:**

0 to 25% 1
26% to 50% 2
51% to 75% 3
76% to 100% 4

D. Student body composition (please estimate percent):

White, not Hispanic ________%
Black, not Hispanic ________%
Hispanic ________%
Asian or Pacific Islander ________%
American Indian/Alaskan Native ________%
Other (Specify):________________ ________%
Should Sum to 100%

Your Current Status

19. What is your current employment status? **(Circle one response)**

Classroom teacher in grades K-12 (any grade or combination of grades) **(SKIP TO Q. 23)** . 1

Teaching position outside of grades K-12 (e.g., a special school or post secondary school) 2

Employed by an educational organization in a non-teaching position **(SKIP TO Q. 30)** 3

Employed in an occupation outside of education **(SKIP TO Q. 21)** 4

Not presently employed **(SKIP TO Q. 21)** 5

20. What is your current position? **Please specify job title and type (not name) of employer.**

JOB TITLE ____

TYPE OF SCHOOL/EMPLOYER ______________________________

21. In what year did you leave K-12 teaching? 19________

22. What are the major reasons you decided to leave K-12 teaching?

____

____

____

____

____

______________________________________ **(SKIP TO Q. 39)**

23. At what grade level(s) do you now teach? **(Circle all applicable grades)**

K 1 2 3 4 5 6 7 8 9 10 11 12

Other (Specify): ______________________________

24. Approximately what percentage of a typical work week do you now spend teaching each of the following subjects and on non-teaching activities? Please be sure that the numbers you enter total to 100% of your working time.

Self-contained class that includes all Mathematics and Science Subjects ________%
Mathematics ________%
General or Physical Science ________%
Biology ________%
Chemistry ________%
Physics ________%
Earth, Ocean or Atmospheric Science ________%
Geography ________%
Ecological or Environmental Science ________%
Computer Science ________%
Health Science ________%
Other Science (Specify): ______________________ ________%
Social Studies ________%
Administration (e.g., department chair) ________%
Non-Science or Math Subjects ________%
Non-Teaching Activity (e.g., study hall, counseling) ________%

Should Sum to 100%

25. Which of the following best describes your current teaching status? **(Circle all that apply)**

Pre-service teacher 1
In-service teacher (under-prepared for science and/or mathematics) 2
In-service teacher (well-prepared for science and/or mathematics) 3
Teacher expected to assume leadership position in your **school** or **district** (e.g., "resource," "leader," "master," or "mentor" teacher) 4
Teacher expected to assume leadership positions at the **state** or **national** level. 5
Other (Specify): ____ 6

26. Are you currently teaching at the same school as when you enrolled in TEP?

YES, but characteristics of the school have changed **(GO TO Q. 27)** 1
YES, and the characteristics of the school are the same **(SKIP TO Q. 28)** 2
NO **(GO TO Q. 27)** 3

27. What are the characteristics of the school where you are now teaching? **(Please circle one each)**

A. Location:

City 1
Suburban 2
Rural 3

B. Type:

Public 1
Private 2
Mixed 2

C. Approximate **percentage** of students in this school eligible for **reduced price or free school lunches:**

0 to 25% 1
26% to 50% 2
51% to 75% 3
76% to 100% 4

D. Student body composition

(please estimate percent)

White, not Hispanic __________%
Black, not Hispanic __________%
Hispanic __________%
Asian or Pacific Islander __________%
American Indian/Alaskan Native __________%
Other (Specify):________________ __________%
Should Sum to **100%**

28. Are (or were) there any barriers in your work situation to applying the content or methods that were advocated by the Teacher Enhancement project you attended?

YES 1
NO 2

(If YES, please describe those barriers)

____
____
____
____
____

29. Do you feel that administrators should participate or be involved in such activity as a Teacher Enhancement project like the one you attended?

YES . . . . 1 **(If YES, how? Please explain)**
NO 2

____

____

____

____

____**(SKIPTO Q. 34)**

30. Do you have major **administrative** or **supervisory** responsibilities in K-12 science or mathematics education?

YES 1
NO **(SKIP TO Q. 35)** 2

31. About what proportion of that administrative time is specific to mathematics and/or science eduction?

____________%

32. Briefly, what is the nature of your administrative responsibilities concerning mathematics or science education?

____

____

____

____

33. In what ways, if any, did your participation in this Teacher Enhancement project affect your work as an educational administrator or supervisor?

____

____

____

____

34. Are there any changes in science and/or mathematics instruction that you would like to implement as a result of your participation in the TEP project?

____

____

____

____

Your Career Development

35. Since you finished the TEP project, have you achieved any of the following leadership positions? **(Circle all that apply)**

a. Subject area department head 1

b. Science or mathematics curricula specialist 2

c. Mentor-master teacher 3

d. Principal 4

e. Other administrative role within the district 5

f. Other (Specify): ______________________________ 6

36. Over the past 5 years, have you taken courses for college credit?

YES 1

NO **(SKIP TO Q. 39)** 2

37A. How many semester courses have you taken for credit, in the past 5 years, in science or mathematics **content**?

number of courses ________

37B. How many semester courses have you taken for credit, within the past 5 years, in **methods** for teaching science or mathematics?

number of courses ________

37C. If you have taken such courses, please identify the specific science or mathematics subject matter of these course:

____

____

____

____

38. How many semester courses have you taken for credit, within 5 years, in fields **other than** science or mathematics?

number of courses ________

About Yourself

39. What degree(s) do you hold? **(Circle all that apply)**

a. Bachelor's in Arts/Sciences 1

b. Bachelor's in Education . . 2

c Master's in Arts/Sciences . 3

d. Master's in Education . . . 4

e. Ph.D., D.Sc. 5

f. Ed.D. 6

g. Graduate courses, but no degree . . 7

h. Other (Specify): ____________ . 8

40. **In what field was your highest earned degree? (Circle the one area closest to your major field of study and the one closest to your minor field for your highest degree.)**

	Major	**Minor**
a. Agricultural Science	1	1
b. Astronomy	2	2
c. Atmospheric Sciences	3	3
d. Biological Sciences	4	4
e. Chemistry	5	5
f. Computer Sciences	6	6
g. Geology	7	7
h. Economics	8	8
i. Engineering	9	9
j. Mathematical Sciences	10	10
k. Medical Sciences	11	11
l. Oceanography	12	12
m. Physics	13	13
n. Political Science	14	14
o. Psychology	15	15
p. Sociology/Anthropology	16	16
q. Science Education	17	17
r. Mathematics Education	18	18
s. Other Education	19	19
t. Other Field (Specify): ____________________	20	20

Optional Questions

41. What is your sex?

Male	1
Female	2

42. What is your race/ethnicity?

White, not of Hispanic origin	1
Black, not of Hispanic origin	2
Hispanic	3
Asian or Pacific Islander	4
American Indian or Alaskan Native	5
Other (Specify): ______________________	6

43. Do you have a disability or handicap that limits a major life activity?

NO 1

YES 2

If yes, is it?
- ☐ Visual
- ☐ Orthopedic (mobility)
- ☐ Auditory (hearing)
- ☐ Vocal
- ☐ Other (specify) ______________

44. How old are you? ________ years

45. How many years have you been teaching? ________ years

OTHER GENERAL COMMENTS

46. Please respond briefly to any of the following questions that you wish.

a) Which one aspect of the TEP project do you believe had the greatest value for your science and/or mathematics teaching?

b) In what ways do you believe your students have benefitted from your participation in the TEP project?

c) In your mind, is there a particular in-service education "model" that has great promise for enhancing teacher skills (or that has already has been demonstrated to be effective)?

(over)

d) If you were to participate in your TEP project another time, what change(s) would you like to see made to improve its operations?

e) Do you have any other comments you would like to make about the TEP project you attended or Teacher Enhancement Program as a whole?

f) Do you have any suggestions for the National Science Foundation regarding ways to improve the Teacher Enhancement Program?

THANK YOU FOR YOUR HELP IN COMPLETING THIS SURVEY!

Please return this questionnaire in the self-addressed, postage paid envelope to:

TEP Survey, Abt Associates Inc., 55 Wheeler Street, Cambridge, MA 02138

APPENDIX B

TEP PRINCIPAL INVESTIGATOR QUESTIONNAIRE

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

OMB No.: 3145-0124
Approval Expires: 31 May 1992

A SURVEY OF

NSF TEACHER ENHANCEMENT PROGRAM

PRINCIPAL INVESTIGATORS 1984-1989

[redacted]

Privacy Act and Public Burden Statements. The information requested in the survey is solicited under the authority of the National Science Foundation Act of 1950, as amended. It will be used for overall TEP program assessment purposes. Data about individual projects will be available to NSF staff members only on a "need to know" basis for their official duties. Submission of the requested information is voluntary.

The reporting burden for this survey is estimated to average 45 minutes of your time. Send comments regarding this burden estimate or any other aspect of the collection of information, including suggestions for reducing this burden to:

Herman G. Fleming, Reports Clearance Officer
Division of Personnel and Management
National Science Foundation
Washington, D.C. 20550

and to:

Office of Management and Budget
Paperwork Reduction Project (3145-0121)
Washington, D.C. 20503

INFORMATION FOR COMPLETING SURVEY

PLEASE READ THESE INSTRUCTIONS

1. The Office of Studies, Evaluation and Dissemination, of the Directorate for Education and Human Resources, NSF, is conducting this study of the Teacher Enhancement Program; all grant recipients for the period 1984-1989 are being surveyed.

2. The identifying label placed on the survey cover serves two purposes:

   a. The label identifies the specific project about which you are responding;

   b. The label permits us to keep track of returned forms, in order to individually remind those who have not yet completed the survey to do so promptly.

3. You may have submitted information about certain of the items contained in this survey in previous reports. However, those reports were not formatted in the same way across all projects and were not entered into a computerized data file. Thus, NSF is not able to compile a useful picture of the Teacher Enhancement Program as a whole. In the future, NSF plans to provide a systematic, annual reporting format for routinely collecting certain of these data.

4. While this survey is formatted to require as little of your time as possible, we have asked for a limited number of written comments. NSF is very interested in your opinions about these topics, particularly in your assessment of what went well in your project, and what needed improvement.

5. Two items ask for specific numeric data about the number of teacher participants in your project (Item 9), and for specific amounts of funding from various sources (Item 26). If file records exist, please consult those records to complete these items, so the data will be as accurate as is now possible. If your institution does not have such records, please estimate the answers from memory. (A box is provided to check where your response is based upon estimates.)

6. If any journal articles, newspaper accounts, reports or other such materials exist that discuss your project, and you would be willing to share these with NSF, please enclose a copy with your returned questionnaire.

7. If you have questions about the survey or about individual items, please call Diane Stoner, toll-free at 1-800-777-6492.

8. Return the survey, and any other project materials, in the postage paid envelope to:

TEP Survey
Abt Associates Inc.
55 Wheeler Street
Cambridge, MA 02138

IF POSSIBLE, PLEASE FILL IN THE SURVEY WITHIN THE NEXT THREE (3) DAYS

NSF TEACHER ENHANCEMENT PROGRAM
SURVEY OF PRINCIPAL INVESTIGATORS

If you have been the Principal Investigator of more than one Teacher Enhancement Project, you will receive one survey form for each project. Please answer these questions in terms of the project specified on the cover.

PROJECT GOALS AND OBJECTIVES

1A. **What were/are the major and explicit emphases or goals** for participants in your project? **(Please assign higher values only to those statements below that were clearly emphasized in your project.)**

(Circle one number for each item.)

	Not a Goal		Moderate Goal		Major Goal
Subject Matter Understanding					
a. To improve teacher-specific knowledge of science or mathematics content.	0	1	2	3	4
b. To increase teachers' knowledge of the applications of science or mathematics principles.	0	1	2	3	4
Pedagogical Practice					
c. To develop ways for teachers to enhance student interest in science or mathematics.	0	1	2	3	4
d. To develop skills for improving students' problem-solving or critical thinking abilities.	0	1	2	3	4
e. To construct, investigate, document or refine effective teaching materials.	0	1	2	3	4
f. To give participants experience with "hands-on" activities.	0	1	2	3	4
g. To develop ways for teachers to integrate science and mathematics instruction.	0	1	2	3	4
h. To help teachers learn how to update their teaching practices continuously to take into account new methods and course contents.	0	1	2	3	4

	General Professional Development	Not a Goal		Moderate Goal		Major Goal
i.	To enhance each participant's sense of self-competence as a teacher.	0	1	2	3	4
j.	To develop participants' abilities to lead local in-service teacher training programs.	0	1	2	3	4
k.	To develop participants' abilities to work with other sources (e.g., colleges, museums) of scientific and mathematics expertise.	0	1	2	3	4
l.	Other major emphasis (Specify:)____________	0	1	2	3	4

1B. **Please write the letters corresponding to the three goals (a through l above) that you felt were most strongly emphasized in your project.**

1.________ 2.________ 3.________

2. To what extent were each of the following considerations important to the organizational objectives of your project?

(Circle one number for each item.)

	Type of Emphasis	Not a Goal		Moderate Goal		Major Goal
a.	To address specific local or regional problems or needs for science and mathematics education.	0	1	2	3	4
b.	To increase collaboration among scientists or mathematicians and education specialists at host institution.	0	1	2	3	4
c.	To establish continuing partnerships among faculties of schools, colleges, and universities, and science and mathematics organizations (e.g., museums, zoos).	0	1	2	3	4
d.	To utilize local in-kind or financial support.	0	1	2	3	4
e.	To secure continuing support by project staff of teachers after their return to the classroom.	0	1	2	3	4
f.	To perform an evaluation of the project's affects upon participants – their substantive knowledge, teaching behaviors, or professional development.	0	1	2	3	4

PARTICIPANT RECRUITMENT

3. To what extent did your project focus recruiting toward each of the following types of teacher participant groups?

(Circle one number for each item.)

Teacher Participant Group	Not a Focus		Moderate Focus		Major Focus
a. Pre-service teachers	0	1	2	3	4
b. Well-prepared in-service teachers	0	1	2	3	4
c. Under-prepared in-service teachers	0	1	2	3	4
d. Teachers who are expected to assume leadership positions in their schools or districts (e.g. "resource," "leader," "master," or "mentor" teachers)	0	1	2	3	4
e. Teachers who are expected to assume leadership positions at the state or national level.	0	1	2	3	4
f. Women	0	1	2	3	4
g. Minorities	0	1	2	3	4
h. Physically disabled	0	1	2	3	4
i. Teachers from economically disadvantaged areas	0	1	2	3	4
j. Other (Specify):______________________	0	1	2	3	4

4A. What procedures did you use to recruit teachers for this workshop?

Procedure	Yes	No
a. Sent announcements to local school districts.	1	2
b. Sent announcements to local teacher organizations.	1	2
c. Sent announcements to special interest organizations.	1	2
d. Sent announcements to professional journals, newsletters.	1	2
e. Sent announcements to local newspapers, radio stations.	1	2
f. Asked school districts to select participants.	1	2
g. Visited schools to identify teacher candidates.	1	2
h. Made personal contacts at conferences, meetings.	1	2
i. Other (Specify): ______________________	1	2

		Yes	No
4B.	Did you use any special procedures to recruit:		
a.	**Female teachers?** (IF YES, Please specify): ____________________ ______________________________________	1	2
b.	**Minority teachers?** (IF YES, Please specify): ____________________ ______________________________________	1	2
c.	Teachers with **physically disabilities?** (IF YES, Please specify): ____ ______________________________________	1	2
d.	Teachers from **economically disadvantaged** areas? (IF YES, Please specify): ______________________________	1	2

5A. Did you make special efforts to recruit teachers from district(s) with high minority enrollments?

Yes 1
No 2

5B. IF YES, please specify district(s): ____________________ ____________________
____________________ ____________________ ____________________

6A. At the time you received official notification of the grant award from NSF, how many weeks did you have to recruit participants before your first program?

Number of weeks ______

6B. Was this time:

Adequate (skip to Question 7) 1
A little short 2
Much too short 3

6C. If you indicated that the time was too short, please indicate the number of weeks that would have been adequate for recruitment.

Number of weeks ______

7A. How did you receive the names of applicants for your project?

a. Individuals applied directly 1
b. School districts, schools or other organizations submitted names 2
c. Both direct applications and nominations were accepted 3
d. Other (Specify): ______________________________ 4

7B. Irrespective of how qualified applicants' names were received, please select the alternative below that best describes the balance between applications and enrollment over the life of this project. IF YOU HAD TOO MANY (OR TOO FEW) QUALIFIED APPLICANTS, PLEASE PROVIDE YOUR BEST ESTIMATES OF THE NUMBERS.

a. The number of qualified applicants was about equal to the positions available 1

b. There were too many qualified applicants for the number of the positions available . 2

Please specify: Number Applying: ________
Number Enrolled: ________

c. There were too few qualified applicants for the positions available 3

Please specify: Number Applying: ________
Number Enrolled: ________
Number of Positions Available: ________

7C. Please indicate the three most important criteria by which you selected participants. **(Circle a maximum of three [3] that apply.)**

Applicants were selected chiefly because they:

a. submitted applications early (i.e., on a "first come, first served" basis) 1
b. needed more training in subject matter 2
c. already had a high level of subject matter mastery 3
d. needed more training in pedagogical methods 4
e. already demonstrated superior teaching/leadership abilities 5
f. taught subject/s covered by the project 6
g. taught an appropriate grade level (K-12) 7
h. came from a particular school district 8
i. would be teaching female, minority, or physically disabled students, or students from economically disadvantaged areas 9
j. Other reason (specify) ________________________________ 10

PARTICIPANTS

8. Roughly what percent of project participants came from:

Districts in your locality ________%
Other districts within your state ________%
States in your region ________%
Other regions of the U.S. ________%
Total must equal 100%

9. **How many teachers, or other participants, were new to this project each year?**

Enter number of new participants by year. Do not count participants twice, even if they attended for more than one year. If you do not have exact data, check here ☐ and provide your best estimates. (Leave blank for years that your project was not active.)

1984 ________
1985 ________
1986 ________
1987 ________
1988 ________
1989 ________
1990 ________

Total Number of Participants ________

10A. Of your **total number of participants**, how many were in each of the following five groupings? If you do not have exact data, check here ☐ and provide your best estimates.

1. Total Number By Race/Ethnicity?

White, not Hispanic ________
Black, not Hispanic ________
Hispanic ________
Asian or Pacific Islander ________
Am. Indian or Alaskan Native ________
Total Number ________

2. Total Number By Gender?

Male ________
Female ________
Total Number ________

3. Total Number By Teaching Level?

Classroom Teachers

Kindergarten ________
Elementary ________
Middle/Jr. High ________
Senior High ________
Not Classroom Teachers ________
Total Number ________

4. Total Number of Physically Disabled ________

5. Total Number from Economically Disadvantaged Areas ________

10B. Please estimate the age distribution for the total number of participants:

30 or less years ________%
31-40 years ________%
41-50 years ________%
51-60 years ________%
60+ years ________%
Total must equal 100%

11A. Were your enrollment goals met for the following groups?
[N.A. = Not applicable]

	Yes	No	N.A.
a. Female teachers	1	2	3
b. Minority teachers	1	2	3
c. Physically disabled teachers	1	2	3
d. Teachers from economically disadvantaged areas	1	2	3

11B. If you said "NO" to any of the categories in 11A, please indicate briefly the reasons for the shortfall in enrollment in each such case.

Female teachers: ______________________________

____

Minority teachers: ______________________________

____

Physically disabled: ______________________________

____

From economically disadvantaged areas: ______________________________

____

ASSESSMENT OF PARTICIPANTS' SCIENTIFIC BACKGROUND

12. For **each school level** that you indicated (in Item 10 above) was represented among your participants, please estimate the percentage of participants that fell into categories A-D listed below:

Scientific/Mathematics Background	Kindergarten	Elementary School	Middle/ Jr. High	Senior High
a. Teaching degree; little or no formal science or mathematics training.	___%	___%	___%	___%
b. Teaching degree, with some undergraduate courses in science, engineering, or mathematics.	___%	___%	___%	___%
c. Bachelors degree (or higher) in a field of science, engineering, or mathematics.	___%	___%	___%	___%
d. Other (Specify): ____________________ ______________________________	___%	___%	___%	___%
Totals must equal	**100%**	**100%**	**100%**	**100%**

13. **For each level of school represented in your project, what percentage of participants would you estimate appeared to have a sound grasp of science or mathematics subject matter (relevant to the level of school, and subjects they taught) at the time they entered your project?**

	Kindergarten	**Elementary School**	**Middle/ Jr. High**	**Senior High**
Percent having a sound grasp of science subject matter at outset of Project	___%	___%	___%	___%
Percent having a sound grasp of mathematics subject matter at outset of Project	___%	___%	___%	___%

PROJECT OPERATIONS

14A. For a **typical participant** in your project, please indicate below the time allotted to each of the following program components. (If time allocations differed among cohorts, or "classes" of participants who started in different years, please respond below about the second cohort of teachers in this project).

Did you have this? **IF YES**, please indicate:		Yes	No
a. Summer Program:		1	2
- Number of weeks	______		
- Initial summer, total number of contact hours	______		
b. During School Year:		1	2
- Number of project sessions or meetings for a typical participant	______		
- Total number of contact hours during school year; all meetings:	______		
c. Subsequent summer program(s) for the same typical participant:		1	2
- Number of weeks	______		
- Subsequent summer(s), total number of contact hours	______		
d. Post-summer independent study by participants:		1	2
- Number of hours planned for independent study	______		

14B. Did participants receive formal college credits toward an advanced degree?

Yes 1
No 2

15. Which content areas received major emphasis in your project?

(Circle all that apply in each column)

	Mathematics	**Elementary School Level**	**Middle/Jr. High Level**	**Senior High Level**
a.	Arithmetic, computations	1	1	1
b.	Arithmetic, problem-solving	2	2	2
c.	Geometry	3	3	3
d.	Algebra	4	4	4
e.	Advanced mathematics (e.g., calculus)	5	5	5
f.	Probability/statistics/data analysis	6	6	6
g.	Computer science or programming	7	7	7
h.	Use of computers in mathematics	8	8	8
i.	Other Mathematics (Specify) ______________________	9	9	9
	Science			
j.	Astronomy	10	10	10
k.	Atmospheric Sciences	11	11	11
l.	Biological Sciences	12	12	12
m.	Behavioral Sciences	13	13	13
n.	Chemistry	14	14	14
o.	Computer Sciences	15	15	15
p.	Earth Sciences	16	16	16
q.	Engineering	17	17	17
r.	Information Science	18	18	18
s.	Mathematical Sciences	19	19	19
t.	Material Sciences	20	20	20
u.	Oceanography	21	21	21
v.	Physics	22	22	22
w.	Social Sciences	23	23	23
x.	Interdisciplinary	24	24	24
y.	Science, Technology & Society	25	25	25
z.	Other (Specify):______________	26	26	26

16. **Of all the project's contact hours with participants, please indicate approximately what percent of the time was employed in the following instructional methods?**

	Percent
a. Lecture	________%
b. Hands-on activities	________%
c. Other (Specify):____________________	________%
Total Must Equal	**100%**

17. **Please indicate how often each of the following instructional methods or materials was used in the project. For each category used (i.e., where you circle B or C), please also state your assessment of its effectiveness as a teaching devise in this context.**

	(Circle one letter)			**(If B or C circled, please rate)**				
Methods/Materials	**Not Used**	**Used Some**	**Used Often**	**Ineffective**		**Moderately Effective**		**Very Effective**
a. Lecture.	A	B	C	0	1	2	3	4
b. Small group discussion.	A	B	C	0	1	2	3	4
c. Instructor demonstrations.	A	B	C	0	1	2	3	4
d. Participant hands-on activities.	A	B	C	0	1	2	3	4
e. Cooperative learning groups.	A	B	C	0	1	2	3	4
f. Computer assisted instruction.	A	B	C	0	1	2	3	4
g. Role playing, games or simulations.	A	B	C	0	1	2	3	4
h. Viewing films/videos.	A	B	C	0	1	2	3	4
i. Library research.	A	B	C	0	1	2	3	4
j. Use of resource people.	A	B	C	0	1	2	3	4
k. Field trips.	A	B	C	0	1	2	3	4
l. Examining instructional resources.	A	B	C	0	1	2	3	4
m. Development of student instructional materials.	A	B	C	0	1	2	3	4
n. Peer teaching.	A	B	C	0	1	2	3	4
o. Other (Specify): ____________________	A	B	C	0	1	2	3	4
p. Other (Specify): ____________________	A	B	C	0	1	2	3	4

DEVELOPMENT OF CURRICULA MATERIALS

18A. Were instructional materials developed as part of this project?

Yes 1
No (Skip to Question 22) 2

18B. (IF YES, indicate level/s)

Kindergarten 3
Elementary School 4
Middle/Jr. High School 5
High School 6

18C. Please describe briefly the materials developed.

19. To what extent were each of the following involved in developing materials?

(Circle one number for each item.)

Involved in Developing Materials	Not Involved		Somewhat Involved		Heavily Involved
a. Teacher participants	0	1	2	3	4
b. Principal Investigator	0	1	2	3	4
c. Other project staff	0	1	2	3	4
d. Outside specialists	0	1	2	3	4

20. Were these materials reviewed for content accuracy by PIs or other experts in the relevant disciplines? (Circle one)

Yes (all materials were reviewed) 1
Yes (some materials were reviewed) 2
No 3

21. **How were these materials disseminated? (Circle all that apply)**

a.	**Used by participating teachers**	1
b.	**Shared with other teachers in participants' school systems**	2
c.	**Shared with other teachers not from participants' school system**	3
d.	**Presented at in-service workshops/professional conferences**	4
e.	**Shared with (other) college/university teachers**	5
f.	Published in non-commercial publications, e.g., journals	6
g.	Sold by publishers or educational media producers	7
h.	Other (Specify):______________________________	8
i.	Materials not disseminated	9

PROJECT IMPACTS AND OUTCOMES

22. To what extent do you believe each statement below describes your project and/or its results?

Please use the scale below, on which:

4 = Very true of my project/Most participants benefitted in this way
2 = Somewhat or sometimes true/Maybe half of participants benefitted in this way
0 = Not true, or not characteristic of my project/Few or no participants benefitted in this way
DK = I don't know whether this result occurred or not

(Circle one number for each item)

a.	Participants increased their knowledge of science or mathematics content.	0	1	2	3	4	DK
b.	Participants increased their knowledge of the applications of science or mathematics principles.	0	1	2	3	4	DK
c.	Participants increased their knowledge of sources or types of teaching materials.	0	1	2	3	4	DK
d.	Participants used new materials or lessons in their classrooms.	0	1	2	3	4	DK
e.	Participants disseminated methods or materials from the project by leading in-service sessions in their districts.	0	1	2	3	4	DK
f.	Participants or staff members gave presentations about the project at professional meetings.	0	1	2	3	4	DK

(Circle one number for each item)

g.	Participants served as project staff members or mentors in later years of the project, or in other similar projects.	0	1	2	3	4	DK
h.	Participants remained in contact with each other after the project to discuss teaching strategies or methods.	0	1	2	3	4	DK
i.	Participants remained in contact with project staff.	0	1	2	3	4	DK
j.	Participant established working partnership with local science resource (e.g., college, museum, etc.)	0	1	2	3	4	DK
k.	Participants' home school districts provided adequate support for using the content or methods learned in the project.	0	1	2	3	4	DK
l.	The project increased the collaboration between scientists or mathematicians and educational specialists at host institution.	0	1	2	3	4	DK
m.	One or more journal publications resulted from the project.	0	1	2	3	4	DK
n.	Promises for cost-sharing by other organizations were honored.	0	1	2	3	4	DK
o.	Arrangements for cost sharing led to continued collaboration after the project.	0	1	2	3	4	DK
p.	Other (Specify): ______________________________ ______________________________	0	1	2	3	4	DK

23. Some projects included a research component with data collection. What types of data, if any, were collected by your project or by an outside evaluator?

(Circle all that apply)

If no data were collected, check here ☐ and go to Item 24.

		By Your Projects' Staff	By An Outside Evaluator
a.	Measures of participants' content knowledge	1	1
b.	Measures of participants' interest, confidence or other attitudes	2	2
c.	Participants' ratings or evaluation of the project	3	3
d.	Participants' records of their use of project-taught methods or content in their home classroom	4	4

	By Your Projects' Staff	By An Outside Evaluator
e. Project staffs' observations and/or ratings of participants' teaching methods	5	5
f. Measures of student interest or motivation for science or mathematics	6	6
g. Measures of student learning of science or mathematics	7	7
h. Data from administrators/supervisors in participants' home schools	8	8
i. Control or comparison group data	9	9
j. Pre-post measures	10	10
k. Other measure (Specify): ______________________________	11	11
l. Other measure (Specify): ______________________________	12	12

24. If this project terminated after to June 1989, go to Item 25.

In what ways were the project methods/materials used after the project ended? Which of the following was occurring one year after the project ended? (Circle all that apply)

a. Participants using in their own classes 1

b. Participants sharing with other teachers 2

c. School districts using for workshops funded by NSF 3

d. School districts using for workshops funded by sources other than NSF 4

e. Your institution using for in-service teacher education funded by NSF 5

f. Your institution using for in-service teacher education funded by sources other than NSF 6

g. Your institution using for in pre-service teacher education 7

h. Other institutions using for educational purposes 8

i. Other (Specify) ______________________ 9

j. Other (Specify) ______________________ 10

PROJECT FUNDING

25. **Sources of Support**. If your project received financial or other types of support from any sources other than the National Science Foundation, **please circle the number for each source below,** indicating whether the support was in dollars or "in kind" contributions or both. **(Circle all that apply)**

Source		Support in Dollars	Support "In Kind"
a.	Host institution	1	1
b.	Other college or university	2	2
c.	Federally funded R&D laboratory	3	3
d.	Federal government agency	4	4
e.	State government agency	5	5
f.	Local government agency	6	6
g.	Foundation, or educational trust funds	7	7
h.	Museum	8	8
i.	Zoo	9	9
j.	School or district of participating teacher	10	10
k.	Other non-profit organization	11	11
l.	Private industry/for-profit organization	12	12
m.	Individuals	13	13
n.	Participating teachers, individually	14	14
o.	Yourself, and/or other staff members	15	15
p.	Other source (Specify): ________________	16	16

26. **Funding**. On the chart below, please indicate the amount of funding for your project, from all sources. Include here the actual dollars spent by the project, and estimate the dollar value of in kind contributions. **If you do not have exact figures, check here ☐, and provide your best estimates. Leave blank for years that your project was not active.**

Year	(a) Funding from NSF	(b) Dollar Funding - Other Sources	(c) Estimated Dollar Value of In-kind Contribution
1984	$__________	$__________	$__________
1985	$__________	$__________	$__________
1986	$__________	$__________	$__________
1987	$__________	$__________	$__________
1988	$__________	$__________	$__________
1989	$__________	$__________	$__________
1990	$__________	$__________	$__________

PRINCIPAL INVESTIGATOR INFORMATION

27. What was the P.I.'s primary employment base at the time of award? **Check the one response that fits best.**

a. University or 4-year college 1
b. Community or junior college 2
c. Federally funded R&D laboratory (Skip to Question 30) 3
d. Federal government agency (Skip to Question 30) 4
e. State government agency (Skip to Question 30) 5
f. Local government agency (Skip to Question 30) 6
g. Foundation (Skip to Question 30) 7
h. Museum (Skip to Question 30) 8
i. Zoo (Skip to Question 30) 9
j. Public or private elementary/secondary school (Skip to Question 30) 10
k. Other non-profit organization (Skip to Question 30) 11
l. Private industry/for profit organization (Skip to Question 30) 12
m. Other (Specify): ______________________________ 13

28. If P.I. was affiliated with a college or university at the time of award, in what type of department was his or her major affiliation?

a. Mathematics department 1
b. Any science department 2
c. Education school or department 3
d. A center or institute 4
e. Other (Specify):__________________________ . . 5

29. Did the P.I. have tenure at this college/university at the time of award?

Yes 1
No 2

30. How many teacher enhancement projects (for pre-college teachers) had the PI directed prior to this project? **(Circle one)**

None 1
1 - 3 2
4 or more 3

31. What was the P.I.'s highest level of earned degree at the time of award?

Bachelors	1
Masters	2
Doctorate	3

32. In what field was the P.I.'s highest earned degree? (Circle the one field closest to the major field for the highest degree.)

a. Agricultural Science	1
b. Astronomy	2
c. Biological Sciences	3
d. Chemistry	4
e. Computer Sciences	5
f. Earth Sciences	6
g. Economics	7
h. Engineering	8
i. Mathematical Sciences	9
j. Medical Sciences	10
k. Oceanography	11
l. Physics	12
m. Political Science	13
n. Psychology	14
o. Sociology	15
p. Science Education	16
q. Mathematics Education	17
r. Other Education	18
s. Other Field (Specify):________	19

33. What is the PI's sex?

Male	1
Female	2

34. What is the PI's race/ethnicity?

White, of not Hispanic origin	1
Black, not of Hispanic origin	2
Hispanic	3
Asian or Pacific Islander	4
Native American or Alaskan native	5

35. Does the PI have a disability or handicap that limits a major life activity?

Yes	1
No	2

36. What was the PI's age at time of award?

Age at time of Award:________

37. Please estimate the total number of person-days the principal investigator spent on the project in one project year.

Number of days:____________

PROJECT STAFF MEMBERS

38. In addition to the Principal Investigator, how many other persons served as co-investigators or instructional staff members in this project during a typical year?

Number of Persons: ________

39. Please indicate the types of persons who served as co-investigators or instructional staff members, in addition to the P.I., during a typical year of your project (**Circle all that apply**) and, for each category that you circled, indicate your estimate of the **annual number of person-days** for each participant category.

		Category	Annual Person-Days
a.	College or University faculty members in mathematics or computer science	1	______
b.	College or University faculty members in science	2	______
c.	College or University faculty members from education school or department	3	______
d.	Postdoctoral fellows	4	______
e.	Graduate students	5	______
f.	Federally funded R&D laboratory staff	6	______
g.	Federal government agency staff	7	______
h.	State government agency staff	8	______
i.	Local government agency staff	9	______
j.	Foundation staff	10	______
k.	Museum staff	11	______
l.	Zoo staff	12	______
m.	Former project participants	13	______
n.	Pre-college teachers who were not former participants	14	______
o.	Administrators at pre-college educational level	15	______
p.	Curricular specialists from pre-college institutions	16	______
q.	Other non-profit organization staff	17	______
r.	Persons from private industry	18	______
s.	Other type (Specify): ______________________________	19	______

OTHER GENERAL COMMENTS

40. We would like to ask you to respond briefly to any of the following questions that you wish.

a) What do you believe is the most significant accomplishment of your project?

b) What are the specific "lessons learned" from your project that you would like to pass on to other principal investigators?

c) In your mind, is there a particular "model" that has great promise for enhancing teacher skills (or already has been demonstrated to be effective)?

d) If you were to run your project another time, what would be the single most important change (or changes) you would make to improve its operations?

____. (over)

e) Do you have any other points you would like to make with respect to your project?

f) Do you have any suggestions for the National Science Foundation regarding ways to improve the support that it provides to PIs?

g) Do you have any suggestions for the National Science Foundation regarding ways to improve its operation of the Teacher Enhancement Program?

THANK YOU FOR YOUR HELP IN COMPLETING THIS SURVEY!

Please enclose copies of any journal articles, newspaper accounts, reports, or other such materials that discuss your project, that you would like to share with NSF. Please return the questionnaire and other materials in the postage paid envelope to:

TEP Survey, Abt Associates Inc., 55 Wheeler Street, Cambridge, MA 02138

APPENDIX C

TEP PARTICIPANT TABLES

Table 1. Source of Information about Teacher Enhancement Program availability, by year

	All years	1984	1985	1986	1987	1988	1989	1990
How did you learn about the opportunity to participate in TEP?								
Local school district	48.8%	44.1%	50.3%	51.1%	38.8%	45.9%	49.8%	60.5%
Local teacher organization	6.7%	5.6%	6.3%	5.5%	7.2%	9.7%	6.5%	2.9%
A special interest organization or advocacy group	11.0%	6.5%	12.5%	6.4%	11.8%	13.5%	14.1%	5.7%
Another teacher or school administrator	39.9%	50.2%	28.4%	35.0%	49.3%	38.3%	43.3%	39.3%
Professional journal or newsletter	20.5%	20.3%	35.2%	15.3%	23.8%	20.9%	17.7%	12.4%
Local newspapers, or local radio station	3.0%	.4%	.7%	1.7%	.7%	10.0%	.2%	1.7%
The TEP Project Director visited my school	.8%	.3%	.5%	.1%	.3%	.7%	.7%	2.5%
The TEP PD made personal contact with me	7.5%	4.9%	7.0%	2.4%	6.8%	7.2%	11.6%	8.8%
Other	7.0%	13.8%	6.6%	6.8%	4.2%	9.9%	4.3%	6.8%
Contacted directly by project leaders by letter or phone	.7%	1.5%	.4%	.8%	1.7%	.1%	.8%	.4%
Contacted by state education agency	.1%	.7%	.5%			.1%	.0%	.1%
From college / university education departments / schools	1.8%	.9%	2.7%	.3%	.7%	4.1%	1.1%	1.0%
Contacted by former participants	.5%			.3%	.3%	1.7%	.1%	
From National professional organization	1.4%		.3%	.5%	.2%	2.8%	1.1%	2.9%
Wrote NSF directly	.5%			4.3%	.3%			
Bulletin board	.1%		.0%		.4%			
Don't know	1.7%	10.5%	2.3%	.6%	.7%	.8%	1.5%	2.4%

	All years	1984	1985	1986	1987	1988	1989	1990
Unweighted total number of respondents	2390	131	308	199	299	376	715	362

Note: multiple responses were allowed; therefore columns sum to more than 100%

Table 2. Reasons for participation in a Teacher Enhancement Program, by year and level of importance

How important was each in your decision?	All years	1984	1985	1986	1987	1988	1989	1990
SUBJECT MATTER UNDERSTANDING								
Improve knowledge of science/math content								
Not Important	1.0%	1.7%	.3%	2.8%	.8%	.2%	.9%	1.3%
...	5.0%	.5%	1.3%	.6%	.8%	11.3%	4.7%	6.8%
Moderately Important	11.2%	10.0%	5.6%	7.6%	12.3%	12.5%	12.1%	14.4%
...	19.6%	27.0%	18.2%	13.3%	17.7%	20.9%	21.0%	21.5%
Very Important	63.3%	60.9%	74.6%	75.6%	68.4%	55.0%	61.3%	56.1%
Increase knowledge of applications of principles								
Not Important	.7%	1.7%	.6%	.5%	.5%	.1%	.5%	1.9%
...	.8%	.5%	.3%	.6%	.4%	1.1%	1.2%	1.1%
Moderately Important	10.6%	7.4%	11.7%	4.7%	4.2%	16.1%	11.9%	10.7%
...	22.8%	35.8%	20.7%	18.8%	16.1%	24.3%	24.9%	25.0%
Very Important	65.1%	54.7%	66.7%	75.4%	78.8%	58.4%	61.6%	61.2%
Increase knowledge of cutting-edge research								
Not Important	6.8%	1.9%	9.6%	5.5%	2.4%	6.0%	3.2%	18.0%
...	8.4%	4.9%	4.5%	18.8%	5.8%	9.3%	8.5%	5.0%
Moderately Important	19.8%	19.2%	19.1%	13.2%	16.0%	20.5%	20.2%	28.3%
...	23.9%	35.7%	27.0%	26.4%	18.9%	21.8%	27.8%	19.0%
Very Important	41.0%	38.5%	39.7%	36.2%	57.0%	42.4%	40.3%	29.7%
PEDAGOGICAL PRACTICE								
Develop ways to enhance student interest								
Not Important	1.3%	.8%	3.6%		.3%	1.1%	2.5%	
...	.7%	3.5%	.6%	.7%	.4%	1.1%	.1%	.2%
Moderately Important	5.8%	5.0%	8.6%	2.2%	5.2%	5.6%	5.8%	7.6%
...	17.1%	20.7%	14.1%	12.7%	19.0%	12.1%	20.6%	23.7%
Very Important	75.1%	69.9%	73.1%	84.4%	75.1%	80.1%	71.0%	68.5%
Learn ways to motivate female, minority, or disabled								
Not Important	9.9%	9.3%	15.0%	11.5%	8.4%	3.4%	8.5%	18.2%
...	14.0%	10.4%	11.4%	21.4%	9.7%	15.4%	18.1%	7.7%
Moderately Important	29.4%	21.7%	25.0%	27.4%	42.9%	28.3%	24.9%	31.3%
...	19.9%	20.7%	20.3%	16.1%	23.6%	17.1%	22.5%	19.7%
Very Important	26.9%	37.9%	28.3%	23.6%	15.4%	35.7%	26.0%	23.1%
Develop additional teaching skills								
Not Important	.8%	.7%	1.3%		.1%	.2%	2.5%	.1%
...	2.1%	1.8%	2.8%	1.2%	.5%	1.4%	1.1%	6.4%
Moderately Important	8.4%	9.8%	6.0%	6.6%	10.5%	5.7%	8.0%	14.1%
...	26.3%	18.4%	25.3%	19.3%	22.8%	32.8%	31.8%	20.6%
Very Important	62.4%	69.3%	64.5%	72.9%	66.1%	59.9%	56.5%	58.7%
Develop or refine teaching materials								
Not Important	1.2%	1.5%	1.3%	.1%	.2%	.2%	4.4%	.2%
...	1.0%	1.2%	3.0%	1.1%	1.1%	.3%	.5%	1.3%
Moderately Important	9.8%	8.7%	12.3%	7.9%	10.6%	6.6%	15.0%	6.8%
...	30.8%	26.8%	26.2%	24.8%	29.8%	32.7%	30.9%	38.2%
Very Important	57.2%	61.8%	57.2%	66.0%	58.3%	60.2%	49.2%	53.5%
Gain experience with hands-on activities								
Not Important	.9%	2.5%	4.1%	.1%	.7%		.3%	.6%
...	1.2%		3.4%	.7%	.3%	1.2%	1.4%	.7%
Moderately Important	5.9%	3.8%	4.2%	4.3%	6.1%	3.2%	10.3%	7.2%
...	20.7%	27.4%	29.4%	18.9%	20.6%	19.0%	15.2%	23.1%
Very Important	71.4%	66.2%	58.9%	76.0%	72.3%	76.7%	72.8%	68.4%
Integrate science and mathematics instruction								
Not Important	6.5%	6.4%	12.3%	4.9%	4.5%	2.4%	6.2%	12.3%
...	8.8%	11.3%	9.1%	6.9%	10.0%	6.4%	10.3%	9.9%
Moderately Important	26.5%	31.5%	27.3%	13.4%	28.8%	27.1%	29.3%	27.5%
...	27.0%	21.6%	23.4%	47.7%	22.7%	19.7%	28.7%	28.7%
Very Important	31.2%	29.2%	27.9%	27.1%	33.9%	44.4%	25.5%	21.6%
Integrate science or math with other subjects								
Not Important	7.2%	8.0%	14.0%	5.7%	7.7%	3.1%	7.9%	7.7%
...	12.3%	11.1%	14.3%	9.4%	13.6%	6.0%	14.5%	19.3%
Moderately Important	25.0%	25.9%	19.9%	12.5%	26.9%	27.5%	29.3%	27.2%
...	24.3%	27.8%	20.6%	29.5%	18.3%	25.4%	26.6%	22.9%
Very Important	31.2%	27.1%	31.2%	42.9%	33.5%	37.9%	21.8%	22.8%

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Table 2, continued

How important was each in your decision?	All years	1984	1985	1986	1987	1988	1989	1990
GENERAL PROFESSIONAL DEVELOPMENT								
Develop ability to lead in-service programs								
Not Important	14.9%	10.5%	12.7%	8.5%	9.5%	16.8%	17.9%	21.3%
...	20.1%	33.0%	24.8%	31.0%	13.6%	19.1%	17.8%	14.8%
Moderately Important	26.5%	27.9%	23.5%	21.3%	25.9%	22.3%	29.6%	36.0%
...	17.9%	13.2%	17.5%	14.7%	17.7%	19.4%	20.7%	16.2%
Very Important	20.5%	15.3%	21.4%	24.5%	33.2%	22.4%	14.0%	11.7%
Develop ability to work with other resources								
Not Important	12.0%	8.7%	14.4%	7.8%	10.2%	10.7%	12.7%	16.9%
...	17.7%	11.8%	16.6%	14.7%	14.1%	25.9%	15.9%	15.6%
Moderately Important	28.3%	27.7%	29.3%	23.3%	29.2%	30.5%	28.2%	27.5%
...	25.8%	26.4%	24.9%	38.2%	32.2%	20.1%	28.8%	15.8%
Very Important	16.1%	25.3%	14.7%	15.9%	14.3%	12.9%	14.4%	24.1%
Earn continuing education credits								
Not Important	25.6%	25.7%	32.1%	34.7%	25.0%	16.9%	27.5%	24.9%
...	13.7%	9.4%	12.6%	13.5%	8.6%	17.0%	11.8%	18.3%
Moderately Important	19.9%	17.9%	17.3%	16.9%	30.5%	16.8%	22.2%	16.5%
...	16.6%	14.4%	14.3%	10.3%	15.2%	20.7%	16.3%	19.4%
Very Important	24.2%	32.5%	23.7%	24.6%	20.6%	28.7%	22.2%	21.0%
Earn credits toward a graduate degree								
Not Important	46.0%	53.3%	50.4%	41.2%	35.8%	40.9%	51.8%	54.3%
...	15.6%	7.2%	15.8%	16.6%	8.6%	19.2%	15.1%	18.6%
Moderately Important	15.9%	20.3%	11.3%	29.7%	29.4%	11.1%	10.9%	8.7%
...	8.4%	7.7%	6.8%	6.8%	7.7%	8.2%	8.8%	11.3%
Very Important	14.2%	11.5%	15.6%	5.7%	18.5%	20.6%	13.4%	7.0%

Table 3. Goals rated as very important, by year

Respondents rating items as very important	All years	1984	1985	1986	1987	1988	1989	1990
SUBJECT MATTER UNDERSTANDING								
Improve knowledge of science/math content	63.3%	60.9%	74.6%	75.6%	68.4%	55.0%	61.3%	56.1%
Increase knowledge of applications of principles	65.1%	54.7%	66.7%	75.4%	78.8%	58.4%	61.6%	61.2%
Increase knowledge of cutting-edge research	41.0%	38.5%	39.7%	36.2%	57.0%	42.4%	40.3%	29.7%
PEDAGOGICAL PRACTICE								
Develop ways to enhance student interest	75.1%	69.9%	73.1%	84.4%	75.1%	80.1%	71.0%	68.5%
Learn ways to motivate female, minority, or disabled	26.9%	37.9%	28.3%	23.6%	15.4%	35.7%	26.0%	23.1%
Develop additional teaching skills	62.4%	69.3%	64.5%	72.9%	66.1%	59.9%	56.5%	58.7%
Develop or refine teaching materials	57.2%	61.8%	57.2%	66.0%	58.3%	60.2%	49.2%	53.5%
Gain experience with hands-on activities	71.4%	66.2%	58.9%	76.0%	72.3%	76.7%	72.8%	68.4%
Integrate science and mathematics instruction	31.2%	29.2%	27.9%	27.1%	33.9%	44.4%	25.5%	21.6%
Integrate science or math with other subjects	31.2%	27.1%	31.2%	42.9%	33.5%	37.9%	21.8%	22.8%
GENERAL PROFESSIONAL DEVELOPMENT								
Develop ability to lead in-service programs	20.5%	15.3%	21.4%	24.5%	33.2%	22.4%	14.0%	11.7%
Develop ability to work with other resources	16.1%	25.3%	14.7%	15.9%	14.3%	12.9%	14.4%	24.1%
Earn continuing education credits	24.2%	32.5%	23.7%	24.6%	20.6%	28.7%	22.2%	21.0%
Earn credits toward a graduate degree	14.2%	11.5%	15.6%	5.7%	18.5%	20.6%	13.4%	7.0%

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Table 4. Three most important goals, by year

Respondents listing item as one of three most important goals	All years	1984	1985	1986	1987	1988	1989	1990
SUBJECT MATTER UNDERSTANDING								
Improve knowledge of science/math content	32.7%	27.9%	40.3%	46.2%	26.8%	23.6%	29.2%	42.1%
Increase knowledge of applications of principles	24.3%	15.9%	30.9%	19.6%	23.1%	27.9%	28.3%	14.9%
Increase knowledge of cutting-edge research	14.9%	15.4%	22.0%	8.3%	16.1%	12.2%	17.5%	13.6%
PEDAGOGICAL PRACTICE								
Develop ways to enhance student interest	45.5%	37.8%	32.8%	54.5%	50.2%	44.0%	44.9%	49.7%
Learn ways to motivate female, minority, or disabled	6.3%	10.0%	11.9%	2.3%	3.1%	5.0%	8.8%	5.3%
Develop additional teaching skills	42.3%	58.3%	47.6%	49.7%	54.1%	31.4%	39.6%	38.2%
Develop or refine teaching materials	19.3%	23.7%	18.8%	16.5%	13.2%	22.0%	19.5%	21.7%
Gain experience with hands-on activities	41.6%	36.0%	28.2%	27.1%	32.3%	53.8%	42.0%	54.0%
Integrate science and mathematics instruction	9.2%	2.9%	6.0%	3.3%	19.6%	9.7%	8.4%	8.4%
Integrate science or math with other subjects	7.2%	2.8%	1.9%	5.4%	8.3%	9.9%	7.5%	8.3%
Learn to update teaching practices with new methods	26.0%	36.2%	24.8%	36.3%	21.9%	27.4%	25.1%	18.7%
GENERAL PROFESSIONAL DEVELOPMENT								
Develop ability to lead in-service programs	6.4%	.7%	4.7%	9.7%	6.3%	8.8%	5.6%	4.3%
Develop ability to work with other resources	3.2%	1.6%	1.6%	5.0%	3.1%	2.3%	3.5%	4.5%
Earn continuing education credits	6.7%	7.2%	7.5%	9.8%	7.9%	5.4%	6.5%	4.7%
Earn credits toward a graduate degree	7.2%	11.3%	10.0%	.8%	10.5%	8.8%	7.3%	2.8%
Other major emphasis or goal	5.1%	11.3%	7.4%	3.0%	2.7%	5.0%	4.3%	6.8%

Table 5. Characteristics of Teacher Enhancement Program Projects Attended, by year

	All years	1984	1985	1986	1987	1988	1989	1990
Did you attend a summer program?	85.6%	86.3%	93.7%	87.0%	93.6%	69.6%	87.4%	91.9%
For how many weeks?								
Median	4	6	4	4	3	4	2	3
Mean	3.8	5.3	4.5	4.2	3.5	4.1	3.1	3.4
Standard deviation	2.2	2.6	2.3	2.2	2.2	2.2	2.1	1.7
How many total contact hours with TEP faculty?								
Median	80	88	80	120	60	100	80	80
Mean	105.4	128.6	112.2	116.4	86.7	116.6	94.4	106.6
Standard deviation	83.8	138.4	93.8	69.3	65.7	74.6	91.5	74.3
Did you attend during the school year?	63.2%	62.9%	45.7%	72.6%	64.9%	62.2%	66.0%	66.6%
How many project sessions did you attend?								
Median	4	3	4	4	4	8	4	5
Mean	8.7	5.2	8.0	9.1	12.6	9.4	6.3	7.7
Standard deviation	26.5	6.3	12.0	13.4	58.8	19.1	10.9	9.9
How many contact hours with TEP faculty?								
Median	20	15	20	16	20	24	20	14
Mean	28.5	24.8	24.3	27.4	34.3	28.7	28.0	26.3
Standard deviation	31.3	34.1	23.1	33.6	31.3	33.6	29.8	29.9
Did you attend subsequent summer programs?	31.1%	9.8%	18.3%	21.6%	39.7%	19.9%	36.3%	55.7%
For how many weeks?								
Median	3	6	4	3	1	4	3	2
Mean	3.5	6.9	4.3	3.4	2.6	4.2	4.1	3.0
Standard deviation	2.8	5.5	2.6	2.3	2.8	2.8	2.8	2.4
How many contact hours with TEP faculty?								
Median	50	80	100	80	40	90	60	45
Mean	88.9	167.6	134.5	78.1	56.2	116.2	99.4	77.1
Standard deviation	102.8	273.6	101.7	48.2	57.7	106.6	136.4	73.9
Did you attend post-summer independent study?	29.1%	43.0%	21.5%	14.3%	38.0%	19.1%	30.6%	45.0%
How many hours of independent study did you spend?								
Median	20	40	25	20	8	20	30	20
Mean	41.9	59.6	42.1	31.6	25.7	38.6	56.3	42.5
Standard deviation	67.2	135.9	44.8	24.9	27.4	48.8	81.1	63.3

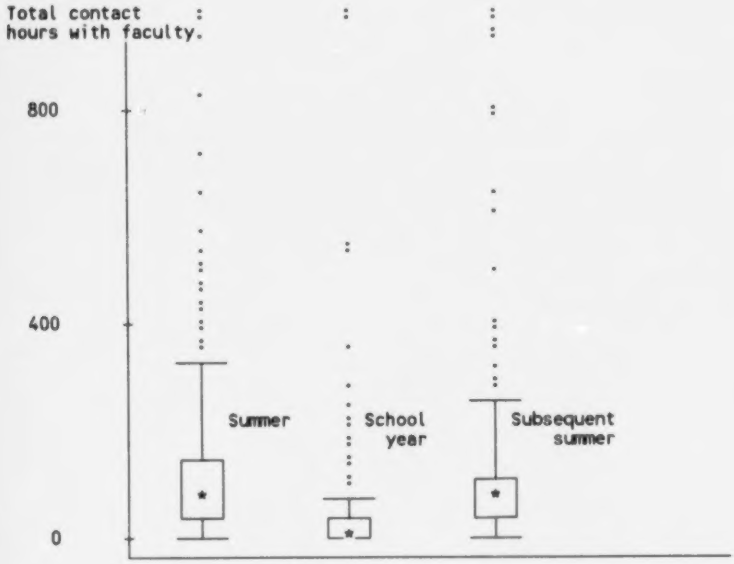

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Table 6. Content areas and instructional methods of projects, by year

Which content areas received major emphasis	All years	1984	1985	1986	1987	1988	1989	1990
Mathematics								
Arithmetic, computations	12.0%	10.0%	7.6%	14.4%	4.1%	18.2%	14.0%	9.2%
Arithmetic, problem-solving	23.5%	20.6%	11.2%	20.4%	32.4%	25.7%	28.2%	18.3%
Geometry	11.9%	5.1%	4.4%	8.9%	10.1%	14.9%	14.6%	15.7%
Algebra	13.0%	3.9%	9.5%	11.3%	15.1%	17.3%	13.9%	9.8%
Discrete mathematics	6.4%	1.9%	4.9%	4.6%	7.2%	10.0%	5.4%	5.6%
Advanced math (e.g., calculus)	6.4%	2.7%	2.6%	9.8%	2.7%	7.9%	7.1%	7.9%
Probability / statistics / data analysis	17.5%	13.1%	6.6%	10.2%	19.9%	20.2%	23.9%	18.1%
Computer science or programming	14.1%	27.4%	22.5%	8.4%	14.7%	12.6%	11.8%	12.8%
Use of computers in mathematics	12.7%	9.7%	8.2%	6.5%	12.5%	13.9%	16.2%	15.9%
Other Math	.2%	.7%	.2%		.1%	.1%	.3%	
Science								
Astronomy	11.2%	23.6%	13.5%	7.3%	5.8%	8.5%	13.0%	15.8%
Atmospheric Sciences	9.7%	20.4%	7.2%	5.5%	3.9%	6.4%	15.6%	15.0%
Biochemistry	7.8%	10.6%	11.0%	3.6%	6.5%	4.8%	8.2%	13.1%
Biological Sciences	32.7%	25.6%	42.3%	34.4%	23.9%	39.3%	27.8%	29.7%
Behavioral Sciences	3.5%	1.1%	7.6%	2.6%	4.6%	1.1%	4.3%	3.0%
Chemistry	26.9%	18.6%	38.2%	20.8%	27.4%	26.0%	27.2%	25.3%
Computer Sciences	10.5%	12.3%	18.3%	5.0%	13.4%	8.4%	6.7%	13.9%
Geology	15.0%	28.4%	12.4%	21.9%	9.4%	11.2%	17.4%	16.2%
Engineering	2.8%	4.6%	3.3%	2.7%	2.1%	2.1%	4.2%	1.6%
Information Science	10.3%	14.6%	10.9%	8.6%	8.2%	9.4%	8.9%	15.2%
Material Sciences	8.3%	17.1%	2.0%	9.5%	6.1%	8.7%	7.8%	12.3%
Oceanography	5.2%	4.3%	4.8%	5.2%	6.4%	4.4%	7.1%	3.0%
Physics	26.8%	22.4%	37.4%	26.8%	24.4%	28.9%	25.2%	19.9%
Social Sciences	3.9%	1.1%	3.6%	1.6%	3.7%	4.9%	3.3%	6.2%
Philosophy or history of science	3.1%	3.3%	3.4%	1.4%	3.3%	.8%	6.3%	3.4%
Interdisciplinary science	11.7%	21.5%	7.0%	10.1%	8.0%	12.1%	11.9%	16.7%
Science, Technology & Society	22.1%	26.5%	17.3%	20.3%	20.9%	20.0%	26.5%	24.5%
Other	.9%		.5%	1.4%		.2%	3.0%	.2%
Modeling	.1%				.0%		.4%	
Environment / ecology	1.2%	.9%	1.0%	1.0%		1.4%	1.5%	1.8%
General Science	.6%	.1%		.7%	.1%	.1%	2.3%	.1%
unspecified physical sciences	.1%				.3%	.1%	.2%	
Not a Science (e.g., language arts)	.2%	.8%	.6%	.1%	.3%	.1%	.1%	.2%
Teaching techniques / learning theory	3.6%	10.5%	.3%	.5%	16.6%	.9%	1.5%	1.4%
More than 10 branches of science	.4%		.3%		1.8%	.1%	.4%	.3%
More than 10 branches of science and math	3.5%	4.1%	1.4%	5.2%	1.4%	2.0%	7.0%	3.7%
What percent of the project's time was spent in each of the following?								
Lecture / recitation								
Average	36.1	36.0	41.2	39.2	33.6	33.9	36.0	35.4
Standard deviation	18.6	19.3	19.6	17.1	15.3	20.0	19.2	17.0
Laboratory work or other hands-on activity								
Average	53.7	47.9	50.3	52.8	58.8	54.1	52.1	55.6
Standard deviation	22.6	20.7	19.6	21.2	21.1	25.1	23.5	21.4
Other								
Average	8.4	15.7	8.5	6.4	7.0	7.9	10.7	6.4
Standard deviation	15.5	19.7	14.4	14.1	13.6	14.8	19.0	12.4

Table 7. Instructional Methods or materials used by Teacher Enhancement Program projects, by year

How often was each of the following methods used in the project you attended?	All years	1984	1985	1986	1987	1988	1989	1990
Lecture								
Not used	2.2%	2.8%	1.5%	.1%	3.5%	2.6%	1.8%	3.1%
Used some	56.2%	59.7%	46.2%	51.2%	61.0%	62.4%	54.9%	56.2%
Used often	41.5%	37.5%	52.3%	48.6%	35.5%	35.0%	43.2%	40.8%
Small group discussion								
Not used	8.0%	12.4%	9.0%	10.8%	8.1%	9.4%	6.7%	3.6%
Used some	57.2%	61.8%	62.6%	62.6%	65.8%	48.9%	55.6%	53.4%
Used often	34.8%	25.9%	28.4%	26.6%	26.1%	41.7%	37.7%	43.0%
Instructor demonstrations								
Not used	6.1%	12.5%	9.2%	4.2%	6.9%	5.7%	5.2%	4.0%
Used some	54.6%	48.3%	50.7%	57.3%	53.3%	57.1%	58.7%	49.8%
Used often	39.3%	39.1%	40.1%	38.5%	39.9%	37.2%	36.1%	46.2%
Participant hands-on activities								
Not used	1.5%	1.6%	.7%	4.0%	.4%	1.5%	1.6%	.8%
Used some	21.1%	18.5%	28.3%	24.2%	23.1%	18.8%	22.2%	13.2%
Used often	77.4%	79.9%	71.0%	71.8%	76.5%	79.7%	76.2%	86.0%
Cooperative learning groups								
Not used	18.6%	22.5%	30.8%	19.6%	16.5%	15.4%	15.0%	18.0%
Used some	39.8%	44.4%	44.6%	37.6%	45.2%	38.6%	39.9%	32.0%
Used often	41.6%	33.1%	24.7%	42.8%	38.2%	46.0%	45.2%	50.0%
Computer assisted instruction								
Not used	58.3%	72.7%	64.2%	59.4%	60.4%	55.5%	58.5%	49.7%
Used some	33.0%	19.7%	27.3%	34.6%	28.6%	36.0%	33.8%	39.1%
Used often	8.8%	7.6%	8.5%	6.0%	11.0%	8.5%	7.7%	11.2%
Computer models, simulations, or games								
Not used	59.0%	72.7%	62.9%	65.3%	56.8%	61.7%	55.6%	50.1%
Used some	33.4%	23.1%	29.8%	29.1%	33.7%	30.3%	37.0%	41.6%
Used often	7.6%	4.2%	7.4%	5.6%	9.5%	7.9%	7.4%	8.3%
Noncomputerized games or role playing								
Not used	56.8%	60.8%	68.7%	60.6%	56.6%	55.9%	48.5%	55.7%
Used some	37.2%	26.9%	30.4%	34.7%	37.7%	36.3%	43.6%	39.4%
Used often	6.1%	12.3%	1.0%	4.7%	5.7%	7.8%	7.8%	4.9%
Viewing films/videos								
Not used	43.9%	35.3%	38.6%	42.3%	46.7%	57.6%	43.6%	29.6%
Used some	51.0%	50.6%	53.9%	53.6%	51.7%	39.7%	50.5%	64.0%
Used often	5.1%	14.1%	7.4%	4.1%	1.6%	2.8%	5.9%	6.5%
Library research								
Not used	59.6%	50.4%	54.5%	54.6%	56.9%	67.1%	61.0%	59.7%
Used some	35.4%	42.1%	35.4%	41.4%	40.4%	28.3%	32.7%	38.6%
Used often	5.1%	7.5%	10.1%	4.0%	2.8%	4.7%	6.4%	1.6%
Use of resource people								
Not used	20.7%	12.1%	21.9%	15.5%	18.0%	35.6%	13.4%	16.2%
Used some	46.8%	43.9%	40.4%	53.8%	53.9%	34.7%	53.2%	50.6%
Used often	32.5%	44.1%	37.6%	30.7%	28.1%	29.7%	33.4%	33.2%
Field trips								
Not used	45.2%	27.5%	38.0%	41.2%	43.6%	63.9%	39.5%	41.4%
Used some	35.7%	32.0%	34.9%	34.6%	45.3%	24.0%	40.0%	40.9%
Used often	19.1%	40.5%	27.0%	24.2%	11.0%	12.1%	20.5%	17.7%
Examining instructional resources								
Not used	20.0%	24.8%	24.2%	25.3%	17.7%	21.2%	14.7%	19.1%
Used some	57.4%	51.4%	55.9%	50.2%	59.7%	53.3%	65.3%	58.3%
Used often	22.6%	23.7%	19.9%	24.5%	22.6%	25.5%	19.9%	22.5%
Peer teaching								
Not used	27.1%	33.0%	35.0%	32.5%	24.3%	26.3%	22.8%	24.5%
Used some	48.7%	55.7%	50.8%	52.2%	40.1%	45.0%	49.0%	55.4%
Used often	24.2%	11.3%	14.2%	15.2%	35.6%	28.7%	28.2%	20.1%

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Table 8. Effectiveness of instructional methods and materials, by year

Indicate your assessment of its effectiveness as a teaching device	All years							
		1984	1985	1986	1987	1988	1989	1990
Lecture								
Ineffective	.3%		.1%	.1%	.4%	.1%	.5%	.4%
...	4.7%	1.0%	3.3%	1.9%	6.7%	10.5%	2.2%	2.3%
Moderately effective	19.3%	21.4%	18.4%	16.2%	23.4%	18.7%	18.9%	19.5%
...	39.8%	41.8%	32.4%	47.7%	33.5%	39.6%	41.8%	42.9%
Very Effective	36.0%	35.7%	45.7%	34.0%	36.0%	31.2%	36.6%	34.8%
Small group discussion								
Ineffective	.2%			1.0%	.0%		.0%	.2%
...	1.1%	.8%	3.1%	1.0%	.5%	.5%	1.1%	.8%
Moderately effective	17.9%	17.1%	14.3%	27.2%	19.9%	17.9%	15.6%	16.6%
...	39.7%	33.2%	40.8%	34.2%	44.6%	38.9%	43.6%	35.6%
Very Effective	41.2%	48.8%	41.9%	36.5%	35.0%	42.7%	39.6%	46.7%
Instructor demonstrations								
Ineffective	.1%				.0%	.1%	.2%	.1%
...	.8%		.5%		.7%	1.7%	.7%	1.0%
Moderately effective	11.7%	15.4%	12.4%	9.8%	12.1%	12.0%	12.9%	8.6%
...	34.4%	34.5%	26.9%	34.6%	29.9%	42.0%	36.4%	30.2%
Very Effective	53.1%	50.0%	60.2%	55.7%	57.2%	44.2%	49.8%	60.0%
Participant hands-on activities								
Ineffective	.1%				.0%		.2%	
...	.3%		.4%	.1%	.5%	.0%	.3%	.7%
Moderately effective	3.8%	2.3%	2.6%	3.7%	4.3%	5.4%	3.8%	2.3%
...	16.9%	20.9%	16.4%	19.0%	18.8%	15.3%	18.1%	13.5%
Very Effective	78.9%	76.7%	80.6%	77.2%	76.4%	79.3%	77.5%	83.5%
Cooperative learning groups								
Ineffective	.1%		.2%		.1%	.1%	.2%	.2%
...	1.1%	1.3%	1.5%	.8%	3.5%	.4%	.6%	.2%
Moderately effective	13.0%	11.8%	11.2%	20.4%	13.6%	12.9%	13.7%	8.3%
...	34.0%	41.5%	39.1%	32.2%	39.0%	28.5%	30.6%	37.6%
Very Effective	51.8%	45.3%	47.9%	46.6%	43.8%	58.2%	54.9%	53.7%
Computer assisted instruction								
Ineffective	1.0%		2.7%	.2%	1.1%	1.9%	.5%	
...	6.6%	8.3%	9.2%	7.8%	13.1%	6.8%	4.6%	.8%
Moderately effective	28.7%	28.5%	27.4%	20.5%	27.5%	23.9%	27.7%	43.0%
...	39.0%	41.8%	32.2%	53.6%	38.6%	36.6%	40.3%	35.9%
Very Effective	24.8%	21.5%	28.4%	17.9%	19.8%	30.7%	26.9%	20.3%
Computer models, simulations, or games								
Ineffective	1.1%	.8%	2.7%	.8%		.3%	.1%	3.2%
...	5.7%	7.5%	4.9%	9.5%	9.8%	5.3%	5.6%	1.2%
Moderately effective	29.6%	27.0%	27.4%	26.0%	37.7%	20.4%	26.0%	41.5%
...	40.0%	46.7%	37.6%	39.0%	34.7%	45.0%	41.0%	38.6%
Very Effective	23.6%	18.0%	27.4%	24.7%	17.8%	29.0%	27.3%	15.4%
Noncomputerized games or role playing								
Ineffective	.8%	2.1%	1.2%		1.7%		1.1%	.8%
...	6.0%	6.6%	2.3%	5.2%	1.8%	13.0%	6.6%	1.2%
Moderately effective	29.6%	39.3%	14.8%	42.0%	37.1%	21.0%	26.7%	38.1%
...	38.6%	22.8%	56.9%	33.9%	33.1%	37.9%	40.9%	37.0%
Very Effective	25.0%	29.2%	24.8%	18.9%	26.3%	28.0%	24.7%	23.0%
Viewing films/videos								
Ineffective	.7%		.5%		.1%	2.4%	.9%	.3%
...	4.7%	1.5%	1.8%	1.7%	9.6%	6.6%	7.2%	1.8%
Moderately effective	34.9%	29.1%	38.7%	40.6%	30.8%	33.0%	28.8%	41.8%
...	38.9%	40.6%	33.1%	44.3%	43.1%	34.6%	44.7%	34.1%
Very Effective	20.7%	28.8%	25.9%	13.4%	16.4%	23.4%	18.3%	22.1%
Library research								
Ineffective	.4%	2.4%		.9%	.1%		.1%	1.0%
...	4.4%	3.3%	.6%	4.4%	5.7%	2.1%	8.3%	4.8%
Moderately effective	41.2%	33.0%	22.7%	32.3%	55.3%	33.0%	44.8%	61.5%
...	34.8%	47.9%	40.7%	50.3%	30.4%	42.2%	24.1%	21.2%
Very Effective	19.2%	13.4%	36.1%	12.1%	8.4%	22.7%	22.7%	11.5%

Note: responses based on those who reported the method was "used some" or "used often" (see table 7).

Table 8, continued

Indicate your assessment of its effectiveness as a teaching device	All years							
		1984	1985	1986	1987	1988	1989	1990
Use of resource people								
Ineffective	.0%			.1%			.0%	
...	1.2%	.8%	.2%	.6%	1.1%	2.3%	1.9%	.7%
Moderately effective	15.1%	6.3%	10.8%	6.5%	15.2%	16.5%	20.4%	18.3%
...	36.4%	39.8%	38.4%	40.8%	30.4%	32.9%	40.6%	33.8%
Very Effective	47.2%	53.2%	50.6%	52.0%	53.3%	48.3%	37.1%	47.2%
Field trips								
Ineffective	.1%	.6%	.3%	.2%				
...	1.1%			1.2%	.3%	4.3%	1.0%	.2%
Moderately effective	12.9%	5.4%	10.5%	10.6%	18.0%	19.2%	10.2%	13.3%
...	27.5%	26.6%	27.5%	25.5%	33.9%	21.5%	29.0%	26.6%
Very Effective	58.5%	67.4%	61.7%	62.5%	47.9%	55.0%	59.8%	59.9%
Examining instructional resources								
Ineffective	.2%	.3%			.2%		.1%	.8%
...	1.6%	3.2%	.1%	1.7%	3.1%	.5%	1.9%	2.2%
Moderately effective	23.7%	19.6%	21.0%	21.0%	16.7%	28.1%	28.7%	21.7%
...	43.8%	38.7%	38.7%	40.5%	50.0%	44.7%	46.3%	40.6%
Very Effective	30.7%	38.3%	40.2%	36.9%	30.0%	26.7%	23.0%	34.8%
Peer teaching								
Ineffective	.6%					1.2%	1.1%	.6%
...	1.3%	.4%	.7%	3.1%	.7%	2.7%	.6%	.3%
Moderately effective	15.9%	25.8%	21.5%	24.1%	11.3%	15.2%	12.2%	14.2%
...	37.0%	33.5%	35.4%	37.8%	33.6%	32.0%	40.9%	42.9%
Very Effective	45.3%	40.3%	42.4%	35.0%	54.5%	48.8%	45.2%	42.0%

Note: responses based on those who reported the method was "used some" or "used often" (see table 7).

Table 9. Participant ratings of Teacher Enhancement Program projects, by year

How would you rate the TEP project on each of the following items?	All years							
		1984	1985	1986	1987	1988	1989	1990
Relevance of the content to teaching assignments								
Poor	.8%		.1%	.1%	1.0%	2.0%	.6%	.4%
...	2.5%	.9%	4.5%	1.2%	.8%	.8%	4.6%	3.7%
Good	15.5%	27.5%	14.5%	9.9%	14.7%	16.6%	17.9%	12.0%
...	26.8%	23.3%	25.8%	32.1%	26.1%	25.2%	26.1%	29.0%
Excellent	54.4%	48.3%	55.1%	56.7%	57.4%	55.4%	50.8%	54.9%
Knowledge of staff members: content, subject matter								
...	.9%		.2%		.7%	1.9%	1.1%	.7%
Good	5.7%	2.4%	2.3%	2.9%	6.2%	7.5%	8.9%	3.7%
...	17.1%	15.0%	22.1%	17.3%	15.3%	16.7%	16.1%	16.6%
Excellent	76.4%	82.6%	75.4%	79.8%	77.8%	73.9%	73.9%	79.0%
Knowledge of staff members: schools and teaching								
Poor	.8%	.7%	.7%	.2%	1.2%	.0%	1.5%	1.1%
...	4.5%	.9%	5.2%	7.4%	5.8%	3.1%	4.6%	3.8%
Good	14.7%	15.5%	15.6%	11.1%	12.8%	10.3%	22.6%	13.1%
...	37.3%	34.4%	41.8%	36.7%	33.5%	46.0%	29.9%	36.0%
Excellent	42.6%	48.5%	36.7%	44.7%	46.6%	40.5%	41.3%	46.1%
Quality of printed materials used								
Poor	.3%				.2%	1.1%	.2%	.2%
...	2.2%	1.7%	3.2%	1.4%	2.2%	2.7%	1.6%	2.1%
Good	17.4%	18.7%	15.4%	11.8%	21.0%	17.7%	17.5%	18.6%
...	34.9%	37.4%	43.3%	34.3%	29.6%	31.7%	34.8%	37.7%
Excellent	45.2%	42.1%	38.1%	52.5%	47.0%	46.8%	45.9%	41.5%
Clarity of labs and other hands-on activities								
Poor	.4%				.4%	1.5%	.0%	.0%
...	1.6%	1.1%	4.9%	1.2%	1.0%	.2%	1.8%	1.6%
Good	12.3%	7.7%	7.0%	10.5%	11.9%	17.5%	13.7%	10.1%
...	31.4%	38.1%	36.8%	34.8%	32.3%	29.3%	28.2%	29.0%
Excellent	54.3%	53.2%	51.3%	53.4%	54.5%	51.6%	56.4%	59.2%
Usefulness of labs or other hands-on activities								
Poor	1.4%	.7%	.8%		1.1%	2.4%	2.1%	1.2%
...	3.2%	1.9%	6.4%	3.1%	1.0%	1.3%	4.9%	3.2%
Good	16.7%	16.3%	8.6%	17.5%	18.7%	20.9%	17.7%	13.6%
...	28.5%	28.1%	33.7%	26.6%	27.6%	26.6%	29.4%	28.3%
Excellent	50.2%	53.0%	50.5%	52.8%	51.6%	48.8%	46.0%	53.8%
Adequacy of lab space and other facilities								
Poor	2.0%	.9%	.3%		2.4%	3.6%	2.9%	1.1%
...	3.0%	1.9%	1.0%	1.1%	6.6%	2.3%	3.6%	3.3%
Good	15.2%	14.9%	10.3%	12.0%	13.9%	18.5%	18.6%	13.5%
...	27.0%	25.7%	33.3%	30.2%	24.5%	23.3%	26.9%	27.4%
Excellent	52.8%	56.6%	55.0%	56.7%	52.6%	52.3%	47.9%	54.6%
Responsiveness of staff to participants								
Poor	.1%			.1%	.6%	.0%	.1%	
...	2.4%	2.8%	4.2%	.3%	3.3%	2.9%	2.2%	.6%
Good	6.8%	4.9%	4.3%	3.9%	5.7%	9.4%	9.9%	4.1%
...	20.8%	13.1%	23.8%	25.5%	22.4%	20.3%	18.0%	20.4%
Excellent	69.9%	79.2%	67.6%	70.2%	68.1%	67.3%	69.8%	74.9%
The overall quality of the program								
Poor	.1%				.2%		.2%	.4%
...	.9%	1.0%	1.0%	.9%	.4%	1.3%	.8%	.9%
Good	7.1%	3.1%	2.5%	6.6%	10.1%	6.7%	12.0%	3.2%
...	23.4%	23.4%	30.9%	20.2%	22.5%	22.7%	21.4%	23.8%
Excellent	68.5%	72.4%	65.6%	72.3%	66.8%	69.2%	65.7%	71.7%

Table 10. Participant assessments of benefits of Teacher Enhancement Program projects, by year

How would you rate the TEP project on each of the following items?	All years	1984	1985	1986	1987	1988	1989	1990
Improved knowledge of science/math content								
Not true	1.5%	.8%	.6%	3.2%	3.5%	.1%	1.4%	1.5%
Seldom true	1.8%	1.0%	.7%	.9%	1.2%	2.5%	2.0%	3.1%
Somewhat or sometimes true	9.6%	3.7%	3.6%	11.4%	9.2%	12.2%	13.9%	5.5%
Often true	26.5%	17.6%	31.0%	23.4%	27.3%	30.7%	24.0%	24.6%
Very true	60.4%	76.1%	64.2%	60.8%	58.0%	54.5%	58.7%	65.3%
I don't know	.2%	.7%		.4%	.8%		.1%	
Increased knowledge of the applications of principles								
Not true	1.0%	.8%	.6%	.8%	3.2%	.1%	.8%	1.3%
Seldom true	.9%	1.4%		.9%	.8%	.8%	1.7%	.6%
Somewhat or sometimes true	8.3%	4.6%	7.9%	5.9%	8.0%	8.1%	11.8%	7.1%
Often true	31.4%	38.0%	30.5%	33.2%	32.6%	36.4%	25.9%	28.3%
Very true	58.2%	55.2%	61.0%	59.2%	54.5%	54.5%	59.9%	62.7%
I don't know	.1%		.0%		.8%	.2%		
Increased knowledge of cutting-edge research								
Not true	3.8%	5.2%	2.4%	4.8%	4.2%	2.2%	3.9%	5.8%
Seldom true	8.4%	9.0%	11.4%	5.7%	3.5%	11.8%	7.5%	8.2%
Somewhat or sometimes true	19.8%	12.6%	20.5%	21.4%	19.4%	19.7%	20.5%	19.6%
Often true	33.1%	25.0%	34.1%	24.7%	36.3%	36.7%	32.1%	33.9%
Very true	32.2%	47.2%	27.6%	38.2%	34.7%	27.4%	32.4%	31.4%
I don't know	2.8%	1.0%	4.0%	5.1%	1.8%	2.2%	3.5%	1.2%
Increased abilities to enhance students' interest								
Not true	.8%	.8%	3.5%	.3%	.6%	.1%	.4%	.6%
Seldom true	2.2%	.8%	3.6%	.5%	3.8%	3.5%	1.1%	1.2%
Somewhat or sometimes true	8.1%	3.2%	9.1%	8.6%	7.8%	6.4%	10.9%	7.3%
Often true	34.2%	26.0%	41.5%	35.8%	31.2%	37.8%	33.3%	27.8%
Very true	54.1%	69.0%	41.6%	53.5%	55.3%	52.3%	54.1%	62.8%
I don't know	.5%	.1%	.6%	1.2%	1.3%	.0%	.2%	.2%
Learned ways to motivate female, minority, or disabled								
Not true	13.0%	8.4%	16.9%	13.4%	11.9%	11.9%	12.6%	13.8%
Seldom true	10.9%	12.6%	20.7%	9.0%	11.9%	6.3%	10.8%	9.1%
Somewhat or sometimes true	27.2%	23.7%	26.9%	34.7%	26.3%	24.6%	24.9%	31.6%
Often true	25.5%	19.5%	22.3%	26.0%	21.2%	33.5%	25.3%	22.3%
Very true	16.3%	31.1%	6.4%	10.5%	17.0%	15.9%	18.6%	21.5%
I don't know	7.1%	4.8%	6.9%	6.4%	11.7%	7.8%	7.8%	1.8%
Developed skills for improving students' thinking abilities								
Not true	1.8%	.7%	2.4%	.4%	3.7%	.3%	1.2%	4.1%
Seldom true	2.4%	3.3%	5.3%	2.7%	1.2%	1.9%	1.3%	3.0%
Somewhat or sometimes true	13.5%	10.4%	12.6%	7.5%	11.5%	15.8%	17.8%	12.0%
Often true	41.9%	30.7%	40.2%	51.8%	41.6%	43.6%	41.8%	37.1%
Very true	39.9%	54.9%	39.3%	37.5%	41.7%	37.0%	37.7%	43.0%
I don't know	.5%		.2%		.3%	1.3%	.1%	.7%
Increased knowledge of teaching materials sources/types								
Not true	1.3%	1.5%	1.4%		.6%	3.2%	.7%	.7%
Seldom true	3.0%	.8%	6.1%	2.2%	1.3%	.7%	4.5%	4.1%
Somewhat or sometimes true	12.1%	11.1%	16.3%	9.5%	12.9%	15.3%	9.2%	9.2%
Often true	33.4%	34.3%	27.3%	41.5%	33.2%	29.4%	37.5%	32.6%
Very true	49.0%	52.2%	45.8%	46.7%	51.7%	50.0%	47.8%	50.7%
I don't know	1.2%		3.1%		.3%	1.4%	.3%	2.8%
Learned about materials I used in classroom								
Not true	1.8%	2.7%	1.5%	.4%	.6%	2.7%	2.2%	1.7%
Seldom true	2.9%	.2%	7.2%	.7%	3.1%	1.4%	3.8%	2.3%
Somewhat or sometimes true	9.8%	12.7%	9.0%	12.6%	6.9%	13.0%	8.5%	7.3%
Often true	23.9%	22.1%	28.3%	25.7%	20.9%	24.7%	24.2%	20.1%
Very true	61.4%	62.2%	54.1%	60.6%	68.3%	57.6%	60.9%	68.6%
I don't know	.3%	.1%			.3%	.6%	.3%	

Table 10, continued

How would you rate the TEP project on each of the following items?	All years							
		1984	1985	1986	1987	1988	1989	1990
TEP developed materials I used in classroom								
Not true	4.3%	7.9%	3.2%	4.3%	5.2%	4.6%	4.4%	2.7%
Seldom true	5.3%	3.4%	9.1%	6.4%	2.0%	2.4%	8.3%	4.4%
Somewhat or sometimes true	14.1%	13.8%	9.3%	9.7%	16.2%	15.7%	14.9%	16.4%
Often true	27.6%	22.9%	32.4%	33.6%	22.7%	31.2%	25.5%	22.8%
Very true	48.3%	51.9%	45.5%	45.6%	53.0%	45.9%	46.6%	53.3%
I don't know	.4%	.1%	.5%	.4%	.8%	.1%	.4%	.4%
Improved ability to help with hands-on activities								
Not true	2.3%	.7%	1.6%	3.5%	4.3%	3.6%	1.0%	.3%
Seldom true	2.7%	1.7%	6.2%	4.4%	.7%	.8%	3.3%	2.8%
Somewhat or sometimes true	9.1%	8.5%	7.1%	6.8%	7.5%	9.8%	11.6%	9.3%
Often true	29.6%	37.6%	35.0%	27.5%	26.8%	31.1%	30.9%	21.7%
Very true	56.1%	51.5%	50.0%	57.7%	59.9%	54.8%	53.0%	65.5%
I don't know	.2%				.8%	.0%	.2%	.4%
Developed ways to integrate science and math								
Not true	9.6%	6.1%	9.0%	5.6%	12.4%	6.9%	13.4%	10.1%
Seldom true	9.5%	13.5%	16.2%	6.5%	7.9%	7.2%	7.0%	12.9%
Somewhat or sometimes true	26.8%	31.6%	29.3%	23.3%	26.6%	23.7%	25.2%	32.9%
Often true	30.5%	22.5%	32.3%	40.5%	23.6%	35.6%	32.4%	19.6%
Very true	21.9%	24.8%	11.3%	23.9%	25.2%	23.9%	21.3%	23.8%
I don't know	1.8%	1.4%	1.9%	.1%	4.4%	2.6%	.8%	.8%
Developed ways to integrate science/math with other subjects								
Not true	13.5%	7.2%	21.6%	9.8%	16.1%	9.4%	13.0%	15.6%
Seldom true	12.1%	9.0%	18.9%	11.9%	12.4%	10.8%	13.0%	7.4%
Somewhat or sometimes true	26.9%	24.8%	28.7%	30.7%	24.2%	24.5%	28.4%	27.3%
Often true	27.5%	33.6%	20.0%	31.7%	17.9%	35.6%	26.4%	26.9%
Very true	18.3%	23.9%	9.1%	15.2%	25.3%	17.4%	18.3%	22.2%
I don't know	1.7%	1.5%	1.6%	.7%	4.1%	2.2%	.9%	.7%
Learned to update teaching practices								
Not true	4.9%	3.4%	8.5%	1.4%	6.4%	2.2%	6.2%	5.7%
Seldom true	5.0%	1.9%	7.3%	1.7%	4.2%	3.7%	7.3%	5.8%
Somewhat or sometimes true	18.3%	18.2%	15.7%	17.7%	16.6%	19.8%	20.9%	16.2%
Often true	38.6%	39.2%	36.2%	51.7%	37.9%	37.3%	38.4%	33.9%
Very true	32.1%	37.1%	31.7%	27.0%	32.9%	35.5%	26.1%	37.7%
I don't know	1.1%	.1%	.7%	.5%	2.0%	1.5%	1.0%	.7%
Disseminated materials from TEP project at in-service								
Not true	30.6%	28.7%	35.5%	26.0%	28.5%	32.2%	32.1%	27.7%
Seldom true	8.9%	11.5%	7.5%	11.1%	8.8%	8.1%	7.5%	11.4%
Somewhat or sometimes true	16.0%	11.3%	14.0%	18.9%	11.6%	17.1%	19.0%	15.2%
Often true	17.2%	25.5%	17.0%	21.4%	16.1%	12.4%	19.8%	16.0%
Very true	26.3%	23.0%	25.5%	22.5%	34.5%	28.8%	19.5%	29.7%
I don't know	.9%		.4%		.5%	1.5%	2.1%	
Gave presentations about the TEP at meetings								
Not true	45.3%	46.6%	47.5%	46.6%	38.9%	51.0%	44.0%	40.7%
Seldom true	10.0%	11.2%	12.7%	5.8%	11.4%	7.7%	10.6%	11.8%
Somewhat or sometimes true	11.4%	15.0%	9.3%	17.6%	14.0%	10.3%	11.2%	6.8%
Often true	10.2%	11.7%	7.3%	8.6%	6.1%	10.8%	11.3%	14.8%
Very true	22.3%	15.5%	22.9%	21.4%	29.1%	18.9%	21.0%	25.1%
I don't know	.9%		.3%		.5%	1.3%	2.0%	.7%
Served as a TEP staff member or mentor								
Not true	71.4%	83.3%	66.7%	80.7%	70.5%	68.5%	69.0%	73.4%
Seldom true	6.7%	4.5%	4.6%	6.6%	9.2%	9.3%	4.6%	6.3%
Somewhat or sometimes true	5.3%	.4%	7.9%	6.9%	6.3%	4.5%	5.5%	3.8%
Often true	4.6%	2.4%	2.7%	1.9%	3.7%	6.0%	6.2%	5.7%
Very true	10.8%	9.3%	17.9%	3.9%	9.6%	10.3%	11.7%	10.2%
I don't know	1.1%		.2%		.7%	1.3%	3.0%	.6%

Table 10, continued

How would you rate the TEP project on each of the following items?	All years	1984	1985	1986	1987	1988	1989	1990
Remained in contact with other participants								
Not true	23.8%	22.0%	27.0%	27.7%	12.2%	32.0%	24.7%	15.3%
Seldom true	16.5%	19.9%	16.3%	21.6%	25.7%	13.7%	14.7%	9.7%
Somewhat or sometimes true	19.9%	25.3%	20.7%	23.0%	23.3%	14.5%	21.1%	18.3%
Often true	19.2%	18.7%	20.6%	14.5%	15.3%	19.0%	16.9%	29.2%
Very true	20.6%	14.2%	15.5%	13.3%	22.9%	20.8%	22.5%	27.3%
I don't know	.1%				.5%		.1%	.1%
Remained in contact with TEP project staff								
Not true	36.0%	38.1%	40.9%	38.3%	32.2%	42.4%	34.6%	25.0%
Seldom true	15.6%	17.2%	12.6%	22.3%	20.0%	11.4%	14.8%	16.5%
Somewhat or sometimes true	15.9%	19.9%	16.3%	24.4%	18.5%	9.6%	17.5%	12.1%
Often true	13.4%	14.7%	18.3%	8.0%	11.2%	13.7%	12.3%	16.0%
Very true	18.9%	10.1%	11.5%	7.0%	17.7%	22.8%	20.6%	30.3%
I don't know	.2%		.5%		.3%		.2%	.1%
Established partnerships with local resources								
Not true	48.5%	48.3%	45.0%	46.8%	41.7%	56.5%	49.3%	46.2%
Seldom true	11.6%	19.1%	12.4%	12.3%	14.3%	7.5%	12.2%	10.4%
Somewhat or sometimes true	14.7%	18.0%	15.0%	15.1%	16.5%	11.9%	15.9%	13.9%
Often true	13.0%	6.8%	15.1%	16.5%	11.5%	15.0%	9.8%	13.6%
Very true	11.6%	7.7%	12.5%	9.2%	15.8%	6.7%	12.7%	15.8%
I don't know	.6%				.3%	2.4%	.1%	.2%
Learned a lot from working with other teachers								
Not true	1.3%	2.4%	2.6%	.4%	.4%	.1%	2.5%	1.1%
Seldom true	3.0%	2.5%	1.6%	6.2%	4.3%	2.9%	3.1%	.7%
Somewhat or sometimes true	8.6%	9.6%	5.7%	7.3%	7.4%	9.0%	12.4%	6.9%
Often true	25.7%	35.0%	31.0%	26.6%	24.3%	24.2%	22.4%	25.7%
Very true	61.4%	50.4%	59.2%	59.5%	63.2%	63.8%	59.5%	65.7%
I don't know	.0%				.3%			
Would strongly recommend TEP to another teacher								
Not true	1.3%	2.4%	2.1%	.1%	.4%	.3%	2.5%	1.4%
Seldom true	1.1%		3.1%	.7%	.9%	1.4%	.8%	.1%
Somewhat or sometimes true	3.4%	.8%	2.5%	3.5%	5.9%	3.8%	3.6%	1.8%
Often true	13.0%	10.2%	18.4%	4.0%	10.7%	14.9%	14.5%	13.1%
Very true	81.1%	86.6%	73.9%	91.6%	81.7%	79.6%	78.5%	83.3%
I don't know	.1%				.4%		.1%	.5%

Table 11. Partnerships with other institutions, by year

	All years							
		1984	1985	1986	1987	1988	1989	1990
Have you formed a partnership with other resources?								
Yes	39.6%	45.8%	39.6%	40.7%	45.0%	31.3%	41.0%	42.4%
With what types of institutions?								
College mathematics or computer science faculty	10.9%	8.4%	6.3%	11.2%	20.5%	10.7%	10.7%	6.9%
College science faculty members	25.4%	30.2%	32.6%	32.9%	24.3%	17.4%	24.0%	26.7%
College education faculty members	17.0%	16.3%	13.3%	13.7%	20.3%	15.8%	19.2%	18.3%
Federally funded R&D laboratory staff	4.3%	8.7%	2.0%	1.7%	3.4%	4.6%	5.5%	5.8%
Federal government agency staff	2.2%	2.1%	1.9%	.9%	1.1%	.8%	4.7%	3.1%
State government agency staff	5.9%	7.2%	7.0%	3.3%	7.4%	5.1%	6.1%	6.1%
Local government agency staff	4.1%	5.4%	5.6%	2.9%	3.3%	2.9%	6.3%	2.8%
Foundation staff	2.6%	6.9%	1.8%	2.4%	3.0%	2.2%	2.5%	2.5%
Museum staff	9.4%	13.9%	10.4%	9.3%	10.4%	6.2%	10.3%	10.0%
Zoo staff	3.3%	9.1%	1.7%	5.4%	.2%	3.0%	4.3%	3.3%
Other non-profit organization staff	5.9%	6.5%	7.0%	5.6%	7.7%	4.1%	6.0%	6.2%
Persons from private industry	10.6%	15.8%	6.9%	7.9%	13.9%	8.0%	14.0%	9.8%
Other	3.5%	5.7%	1.8%	.1%	2.1%	4.3%	4.3%	6.0%
No	60.4%	54.2%	60.4%	59.3%	55.0%	68.7%	59.0%	57.6%

Note: Multiple institutions could be identified; therefore percentages for type of institution may exceed total percentage who reported establishing a partnership

Table 12. Changes in classroom instruction since Teacher Enhancement Program, by year

Since your participation in TEP, have you changed your use of any of the following?	All years	1984	1985	1986	1987	1988	1989	1990
Have students work in small groups								
Is the same	24.8%	19.3%	25.7%	22.6%	25.9%	25.5%	21.6%	30.1%
Has increased	74.7%	80.7%	74.3%	77.4%	74.0%	74.5%	75.9%	69.9%
Has decreased	.5%				.0%		2.5%	
Integrate applications into teaching								
Is the same	28.7%	18.7%	35.9%	21.4%	31.6%	29.5%	29.8%	25.4%
Has increased	70.7%	81.3%	63.3%	78.6%	68.4%	70.5%	68.1%	74.1%
Has decreased	.6%		.9%				2.1%	.5%
Provide students with hands-on experiences								
Is the same	18.0%	9.2%	17.2%	15.7%	16.9%	21.7%	19.6%	16.4%
Has increased	80.0%	90.8%	78.2%	83.4%	82.5%	77.7%	75.8%	82.2%
Has decreased	2.1%		4.6%	.8%	.5%	.6%	4.6%	1.3%
Use calculators in the classroom								
Is the same	59.6%	41.4%	64.4%	60.7%	59.1%	57.6%	55.3%	70.9%
Has increased	39.0%	57.9%	34.3%	37.4%	40.0%	41.8%	41.6%	28.8%
Has decreased	1.4%	.7%	1.4%	1.9%	.9%	.6%	3.1%	.2%
Use computers in the classroom								
Is the same	49.5%	43.2%	47.8%	44.8%	40.7%	56.7%	47.0%	58.9%
Has increased	48.4%	55.7%	50.8%	53.9%	57.9%	42.4%	47.5%	40.4%
Has decreased	2.0%	1.1%	1.4%	1.3%	1.3%	.9%	5.5%	.7%
Have students read textbooks in class								
Is the same	54.6%	55.8%	57.0%	44.4%	63.3%	59.5%	52.1%	47.3%
Has increased	10.5%	16.3%	12.8%	11.6%	4.4%	8.5%	13.0%	10.8%
Has decreased	34.9%	28.0%	30.2%	44.0%	32.3%	31.9%	34.8%	41.8%
Have science/math lessons outside the school								
Is the same	58.6%	63.6%	59.6%	49.2%	57.4%	56.6%	60.9%	64.4%
Has increased	39.8%	36.3%	40.2%	48.8%	42.3%	43.0%	33.7%	35.3%
Has decreased	1.6%	.1%	.2%	2.0%	.3%	.5%	5.4%	.3%
Conduct scientific demonstrations for students								
Is the same	35.4%	27.9%	30.7%	37.1%	34.2%	37.6%	38.1%	34.4%
Has increased	60.1%	68.6%	64.3%	61.6%	57.9%	60.7%	55.4%	60.9%
Has decreased	4.5%	3.5%	4.9%	1.4%	8.0%	1.7%	6.5%	4.7%
Give lectures to a whole class								
Is the same	54.4%	65.7%	51.2%	56.6%	50.2%	55.0%	54.0%	56.2%
Has increased	10.9%	11.3%	11.2%	7.7%	11.6%	9.9%	12.5%	11.2%
Has decreased	34.7%	23.0%	37.6%	35.7%	38.2%	35.1%	33.5%	32.5%
Bring guest speakers into class								
Is the same	66.1%	56.9%	60.9%	66.8%	59.2%	73.2%	68.3%	65.7%
Has increased	32.9%	42.9%	38.5%	32.7%	36.3%	26.6%	31.0%	33.8%
Has decreased	1.0%	.1%	.6%	.4%	4.5%	.3%	.7%	.4%
Conduct discussions with class								
Is the same	42.9%	29.7%	38.2%	37.8%	41.7%	45.5%	42.2%	53.5%
Has increased	55.3%	70.2%	60.8%	61.8%	56.4%	52.3%	54.5%	44.9%
Has decreased	1.9%	.1%	1.0%	.4%	1.8%	2.3%	3.3%	1.5%
Use a variety of testing formats and styles								
Is the same	44.1%	29.7%	47.3%	44.7%	44.5%	45.7%	39.4%	49.4%
Has increased	55.2%	70.2%	52.0%	55.3%	55.2%	54.2%	58.2%	49.9%
Has decreased	.8%	.1%	.7%		.3%	.1%	2.4%	.7%
Help students find answers to their own questions								
Is the same	30.8%	22.2%	32.7%	20.1%	30.9%	38.8%	31.1%	27.3%
Has increased	66.8%	77.5%	66.7%	79.9%	61.8%	57.6%	67.6%	71.0%
Has decreased	2.4%	.3%	.6%		7.2%	3.6%	1.3%	1.8%
Help students guide their own learning								
Is the same	33.0%	26.1%	36.4%	25.8%	35.9%	36.5%	32.1%	31.0%
Has increased	66.4%	72.6%	60.9%	74.1%	64.0%	63.5%	67.4%	69.0%
Has decreased	.6%	1.3%	2.7%	.1%	.1%		.5%	.0%

Table 13 A. Perceived role of TEP in increasing activities

Responses of participants who reported increases in specific activities	All years	1984	1985	1986	1987	1988	1989	1990
Have students work in small groups								
Major impact	27.4%	24.2%	30.9%	38.2%	35.1%	15.4%	21.6%	35.4%
...	31.0%	35.4%	23.9%	19.7%	32.5%	28.3%	35.6%	42.1%
Moderate impact	33.9%	32.3%	39.5%	37.4%	24.7%	45.7%	32.0%	19.0%
...	4.4%	2.2%	2.9%	2.8%	4.3%	3.6%	9.7%	1.9%
No impact	3.4%	5.9%	2.8%	1.9%	3.3%	6.9%	1.2%	1.6%
Integrate applications into teaching								
Major impact	26.8%	23.1%	46.3%	22.6%	39.6%	11.9%	20.3%	35.0%
...	35.1%	43.2%	26.2%	42.7%	23.7%	43.8%	34.4%	31.2%
Moderate impact	33.5%	28.1%	24.0%	33.1%	25.0%	42.1%	39.2%	30.8%
...	3.8%	5.4%	1.6%	.5%	11.2%	1.8%	4.2%	3.0%
No impact	.8%	.2%	1.9%	1.0%	.5%	.3%	1.9%	
Provide students with hands-on experiences								
Major impact	46.7%	34.5%	46.0%	49.2%	53.9%	42.6%	39.8%	55.9%
...	31.1%	37.0%	30.8%	34.4%	24.8%	25.3%	38.6%	32.7%
Moderate impact	19.8%	27.3%	21.4%	15.1%	18.1%	31.0%	16.4%	9.3%
...	1.9%	.3%	1.6%	.9%	2.7%	.8%	4.4%	1.4%
No impact	.5%	.8%	.1%	.4%	.4%	.3%	.8%	.7%
Use calculators in the classroom								
Major impact	32.7%	27.6%	23.7%	32.4%	53.4%	32.3%	25.1%	24.6%
...	27.3%	31.7%	22.9%	25.5%	16.8%	30.3%	29.9%	39.6%
Moderate impact	22.6%	15.8%	35.6%	28.4%	20.4%	16.7%	20.7%	27.6%
...	7.1%	18.7%	7.9%	4.6%	7.0%	4.2%	8.3%	4.1%
No impact	10.3%	6.2%	9.8%	9.1%	2.4%	16.4%	15.9%	4.0%
Use computers in the classroom								
Major impact	29.8%	22.3%	29.6%	32.0%	23.2%	37.0%	22.2%	40.6%
...	23.7%	36.5%	15.5%	22.7%	27.3%	24.0%	24.9%	22.0%
Moderate impact	24.9%	21.2%	44.2%	28.8%	20.9%	16.4%	20.1%	26.2%
...	10.9%	4.5%	5.9%	6.6%	16.3%	10.5%	18.3%	5.6%
No impact	10.7%	15.4%	4.8%	9.9%	12.3%	12.2%	14.5%	5.6%
Have students read textbooks in class								
Major impact	20.0%	50.0%	15.3%	7.7%	12.5%	23.2%	18.4%	21.3%
...	27.3%	24.5%	33.0%	28.6%	14.3%	14.9%	37.8%	21.8%
Moderate impact	35.9%	12.4%	40.5%	52.6%	64.4%	41.2%	19.6%	43.5%
...	9.9%	3.1%	3.6%			15.4%	19.4%	6.8%
No impact	6.9%	10.1%	7.5%	11.1%	8.8%	5.3%	4.7%	6.7%
Have science/math lessons outside the school								
Major impact	29.4%	7.3%	28.0%	46.0%	14.5%	23.1%	32.1%	47.3%
...	34.5%	43.0%	40.7%	24.8%	27.5%	33.2%	43.1%	39.7%
Moderate impact	29.0%	34.3%	28.6%	26.1%	50.3%	31.3%	17.2%	10.8%
...	5.4%	10.5%	1.2%	1.3%	7.6%	9.6%	6.1%	.7%
No impact	1.7%	4.8%	1.5%	1.8%	.1%	2.7%	1.5%	1.4%
Conduct scientific demonstrations for students								
Major impact	33.9%	22.7%	40.5%	50.3%	39.9%	24.3%	23.7%	39.7%
...	37.5%	38.4%	35.2%	30.1%	30.8%	34.1%	47.9%	43.1%
Moderate impact	25.4%	35.7%	23.2%	18.6%	21.4%	40.2%	20.3%	16.6%
...	2.7%	.9%	1.0%	.9%	7.4%	1.1%	6.6%	.6%
No impact	.5%	2.2%		.1%	.5%	.3%	1.5%	.1%
Give lectures to a whole class								
Major impact	22.5%	1.9%	54.1%	11.7%	4.3%	21.3%	25.4%	21.2%
...	39.5%	63.7%	6.9%	58.2%	84.0%	18.1%	17.6%	65.9%
Moderate impact	28.1%	33.2%	14.8%	28.9%	7.2%	44.1%	47.4%	9.6%
...	2.8%			1.2%			8.9%	3.3%
No impact	7.2%	1.2%	24.2%		4.5%	16.6%	.7%	

Note: each item shows responses only for participants who reported increasing that item.

(continued)

Table 13A, continued Perceived role of TEP in increasing activities

Responses of participants who reported increases in specific activities	All years	1984	1985	1986	1987	1988	1989	1990
Bring guest speakers into class								
Major impact	27.9%	8.4%	27.2%	14.9%	49.5%	17.3%	24.7%	41.7%
...	37.7%	33.8%	50.2%	41.3%	21.4%	36.6%	41.0%	37.0%
Moderate impact	24.1%	37.6%	17.8%	35.0%	11.0%	37.1%	22.4%	15.7%
...	7.0%	10.2%	3.7%	5.8%	15.6%	3.8%	7.1%	5.6%
No impact	3.3%	10.0%	1.2%	2.9%	2.5%	5.2%	4.7%	
Conduct discussions with class								
Major impact	26.5%	15.3%	34.2%	34.4%	40.9%	15.4%	18.8%	28.6%
...	33.6%	43.6%	39.3%	29.6%	33.6%	26.9%	34.6%	38.8%
Moderate impact	33.2%	35.7%	23.9%	30.4%	13.1%	54.8%	34.9%	28.7%
...	3.9%	4.1%	2.2%	3.3%	9.1%	2.1%	4.3%	1.7%
No impact	2.8%	1.3%	.4%	2.3%	3.3%	.8%	7.4%	2.2%
Use a variety of testing formats and styles								
Major impact	27.3%	18.5%	27.4%	15.9%	41.6%	21.5%	17.1%	47.0%
...	34.7%	41.9%	43.2%	44.3%	30.4%	32.7%	34.8%	25.8%
Moderate impact	27.8%	24.5%	21.9%	30.2%	16.0%	39.3%	31.5%	21.8%
...	5.8%	5.4%	4.2%	4.7%	10.3%	3.0%	8.0%	4.1%
No impact	4.4%	9.7%	3.4%	4.9%	1.7%	3.5%	8.6%	1.3%
Help students find answers to their own questions								
Major impact	32.8%	42.7%	23.4%	36.5%	55.6%	32.0%	19.3%	30.0%
...	36.5%	26.6%	55.1%	43.6%	25.5%	21.3%	43.9%	38.9%
Moderate impact	25.5%	23.9%	17.5%	14.1%	13.3%	43.7%	29.6%	26.1%
...	3.2%	3.6%	2.7%	3.5%	4.8%	.6%	4.0%	3.7%
No impact	2.1%	3.2%	1.3%	2.5%	.8%	2.4%	3.3%	1.3%
Help students guide their own learning								
Major impact	32.7%	30.9%	35.9%	37.3%	45.7%	30.0%	23.8%	29.7%
...	35.1%	40.4%	46.0%	36.0%	26.7%	26.0%	43.0%	36.6%
Moderate impact	26.8%	17.2%	13.9%	20.2%	19.2%	41.5%	25.7%	31.3%
...	3.3%	6.8%	2.0%	3.1%	7.4%	.6%	4.4%	1.8%
No impact	2.2%	4.8%	2.2%	3.5%	1.0%	1.8%	3.2%	.6%

Note: each item shows responses only for participants who reported increasing that item.

Table 13B. Perceived role of TEP in decreasing activities

Responses of teachers who reported decreases in specific activities	All years	1984	1985	1986	1987	1988	1989	1990
Have students read textbooks in class								
Major impact	23.5%	20.6%	23.1%	17.7%	19.0%	23.0%	27.0%	24.5%
...	25.7%	26.5%	22.0%	24.2%	27.8%	28.7%	27.0%	21.8%
Moderate impact	27.6%	17.6%	23.1%	27.4%	31.6%	27.0%	28.3%	30.9%
...	9.9%	11.8%	13.2%	11.3%	8.9%	9.8%	8.0%	10.9%
No impact	13.3%	23.5%	18.7%	19.4%	12.7%	11.5%	9.7%	11.8%
Give lectures to a whole class								
Major impact	18.2%	7.3%	13.7%	25.0%	19.8%	20.5%	18.2%	18.8%
...	33.7%	46.3%	36.3%	33.3%	23.8%	37.6%	33.5%	32.1%
Moderate impact	33.4%	29.3%	32.4%	26.7%	37.6%	31.6%	34.3%	35.7%
...	7.3%	4.9%	8.8%	5.0%	10.9%	4.3%	7.2%	8.0%
No impact	7.4%	12.2%	8.8%	10.0%	7.9%	6.0%	6.8%	5.4%

Note: each item shows responses only for participants who reported decreasing that item. (Items not shown had few or no reported decreases.)

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Table 14. Changes in student characteristics since participation in a Teacher Enhancement Program, by year

Do you believe your students have [changed] in any of the following characteristics?	All years	1984	1985	1986	1987	1988	1989	1990
Interest/enthusiasm in class								
Is the same	18.5%	12.6%	22.2%	19.6%	25.5%	19.3%	18.5%	9.6%
Has increased	80.0%	82.9%	75.8%	79.8%	74.2%	80.7%	78.2%	89.3%
Has decreased	1.4%	4.5%	2.1%	.6%	.2%		3.3%	1.1%
Classroom test scores								
Is the same	46.1%	30.9%	44.3%	45.3%	45.2%	44.9%	48.4%	51.8%
Has increased	52.0%	64.7%	53.1%	54.7%	53.7%	51.1%	51.0%	46.8%
Has decreased	1.9%	4.5%	2.6%		1.1%	3.9%	.6%	1.4%
Enrollment in advanced courses								
Is the same	59.5%	36.6%	48.0%	60.6%	55.3%	60.7%	69.3%	62.7%
Has increased	38.9%	58.8%	49.4%	38.6%	42.9%	38.1%	30.2%	34.8%
Has decreased	1.6%	4.5%	2.6%	.8%	1.8%	1.2%	.5%	2.5%
Involvement in projects outside of class								
Is the same	54.6%	48.2%	49.1%	42.9%	55.4%	56.8%	57.7%	59.6%
Has increased	44.5%	50.4%	50.6%	56.1%	43.2%	41.9%	41.7%	40.3%
Has decreased	.9%	1.4%	.3%	1.0%	1.4%	1.4%	.6%	.1%
Participation in science fairs or contests								
Is the same	63.7%	48.8%	59.8%	62.0%	64.7%	67.5%	64.2%	64.5%
Has increased	34.5%	45.8%	39.1%	38.0%	30.4%	30.3%	34.9%	35.4%
Has decreased	1.8%	5.5%	1.1%		4.9%	2.2%	.9%	.1%
Standardized test scores								
Is the same	56.1%	44.2%	57.1%	58.5%	51.9%	47.7%	63.9%	63.0%
Has increased	42.2%	51.9%	41.6%	41.3%	46.9%	48.3%	35.6%	36.0%
Has decreased	1.7%	3.9%	1.3%	.2%	1.2%	4.0%	.5%	1.0%
Selection of a science/math major in college								
Is the same	61.7%	49.8%	47.9%	63.1%	57.4%	61.7%	73.6%	63.3%
Has increased	37.9%	48.7%	51.4%	36.9%	42.6%	38.3%	25.8%	36.0%
Has decreased	.4%	1.5%	.7%				.6%	.7%
Interest in science/math as a career								
Is the same	50.4%	45.2%	39.1%	51.3%	44.8%	54.2%	60.9%	45.7%
Has increased	49.2%	51.8%	60.2%	48.7%	55.2%	45.8%	38.5%	53.9%
Has decreased	.4%	3.0%	.7%				.6%	.4%

Table 15. Perceived role of TEP in improving student characteristics

Responses of participants who reported increases in specific activities	All years	1984	1985	1986	1987	1988	1989	1990
Interest/enthusiasm in class								
Major impact	33.8%	42.0%	24.1%	47.6%	48.1%	26.7%	25.7%	35.3%
...	38.3%	32.3%	53.2%	21.2%	27.8%	38.6%	48.7%	39.3%
Moderate impact	24.6%	23.9%	19.1%	30.3%	21.0%	31.7%	19.0%	23.5%
...	2.2%	1.8%	2.6%	.7%	2.9%	2.7%	2.1%	1.9%
No impact	1.1%		1.1%	.1%	.1%	.3%	4.5%	
Classroom test scores								
Major impact	26.6%	33.5%	12.0%	22.7%	45.2%	19.5%	24.7%	27.7%
...	35.8%	40.5%	50.0%	30.7%	27.0%	39.9%	31.6%	37.3%
Moderate impact	29.7%	23.2%	32.2%	41.2%	24.1%	33.2%	29.3%	24.9%
...	5.7%	.9%	4.5%	4.3%	3.0%	6.7%	6.6%	9.8%
No impact	2.2%	1.9%	1.2%	1.1%	.6%	.7%	7.8%	.3%
Enrollment in advanced courses								
Major impact	26.7%	20.3%	38.2%	14.2%	16.8%	35.2%	16.4%	33.0%
...	34.2%	47.6%	36.6%	24.8%	29.6%	36.3%	43.2%	22.9%
Moderate impact	29.2%	22.4%	21.6%	49.4%	30.7%	24.1%	29.5%	34.2%
...	7.3%	5.6%	1.1%	10.4%	19.8%	2.8%	7.3%	6.7%
No impact	2.7%	4.1%	2.6%	1.1%	3.1%	1.7%	3.6%	3.2%
Involvement in projects outside of class								
Major impact	33.1%	16.6%	26.2%	40.8%	21.0%	45.1%	26.9%	35.1%
...	35.7%	50.0%	42.0%	27.1%	37.9%	29.6%	35.2%	43.7%
Moderate impact	26.9%	25.8%	28.5%	25.3%	35.5%	24.5%	31.9%	17.1%
...	2.4%	2.9%	1.1%	3.3%	3.9%	.5%	3.9%	2.3%
No impact	1.9%	4.7%	2.2%	3.5%	1.7%	.3%	2.0%	1.8%
Participation in science fairs or contests								
Major impact	31.1%	17.6%	25.7%	17.0%	24.6%	50.4%	24.7%	33.5%
...	33.6%	59.0%	39.5%	43.0%	40.7%	16.6%	37.5%	29.7%
Moderate impact	28.0%	20.1%	29.8%	21.9%	21.5%	29.8%	30.1%	31.7%
...	6.1%	3.3%	4.0%	15.3%	12.6%	2.2%	7.1%	2.9%
No impact	1.2%		1.1%	2.8%	.6%	1.0%	.6%	2.1%
Standardized test scores								
Major impact	23.5%	26.0%	15.5%	5.0%	53.1%	11.3%	16.5%	30.0%
...	41.1%	45.2%	49.1%	43.5%	14.6%	52.5%	49.7%	38.0%
Moderate impact	27.3%	28.5%	27.4%	40.7%	30.3%	21.3%	25.8%	26.8%
...	7.0%	.3%	4.9%	10.5%	1.0%	14.6%	5.0%	5.0%
No impact	1.1%		3.2%	.3%	.9%	.2%	2.9%	.1%
Selection of a science/math major in college								
Major impact	14.7%	11.7%	15.7%	5.6%	11.3%	14.0%	10.7%	27.3%
...	39.4%	51.1%	52.1%	28.2%	38.2%	48.5%	33.0%	21.4%
Moderate impact	35.8%	32.3%	25.4%	59.2%	35.4%	32.6%	45.5%	31.6%
...	9.1%	4.9%	5.3%	6.6%	14.5%	3.6%	8.8%	19.1%
No impact	1.1%		1.4%	.4%	.7%	1.3%	2.0%	.6%
Interest in science/math as a career								
Major impact	16.5%	11.9%	16.5%	5.5%	16.5%	14.0%	18.0%	24.2%
...	37.9%	54.1%	48.3%	39.4%	28.7%	51.6%	32.3%	21.3%
Moderate impact	39.0%	32.1%	28.8%	50.7%	42.5%	27.8%	43.9%	49.5%
...	5.6%	2.0%	5.1%	2.6%	11.3%	5.6%	4.3%	4.5%
No impact	1.1%		1.2%	1.8%	1.0%	1.1%	1.5%	.6%

Note: each item shows responses only for participants who reported increases in that item. Decreases were reported by 2% or fewer of respondents (see table 14)

Table 16. Pre- and post-Teacher Enhancement Program experience with possible follow-up activities, by year

	All years	1984	1985	1986	1987	1988	1989	1990
Activities before attending TEP								
Made presentations to other teachers outside of my school	20.4%	15.3%	25.8%	21.0%	21.3%	18.6%	21.2%	17.5%
Served as mentor to other teachers within my school	28.8%	25.8%	34.3%	28.5%	29.1%	26.9%	28.3%	28.1%
Served as mentor to other teachers outside my school	12.4%	11.8%	11.4%	18.5%	13.6%	9.6%	13.7%	9.8%
Organized in-service activity within my school	10.8%	6.5%	11.4%	14.1%	11.1%	10.6%	9.3%	11.1%
Organized in-service activity outside my school	10.2%	8.7%	10.8%	13.6%	12.6%	9.6%	10.6%	5.6%
Made a presentation at a professional meeting	14.2%	11.2%	22.5%	12.8%	15.3%	10.4%	16.5%	10.4%
Served as staff member in summer program	5.6%	3.0%	7.7%	9.6%	1.9%	5.9%	5.4%	4.7%
Appointed as team leader, chair, or mentor	19.2%	15.8%	25.9%	23.2%	15.5%	17.2%	18.0%	19.8%
Wrote for professional publications	8.3%	5.8%	14.6%	10.4%	5.1%	6.1%	8.1%	8.4%
Used a computer network to maintain contacts	2.7%	1.5%	2.9%	4.5%	1.1%	2.5%	3.3%	2.2%
Contacted someone at a college or university	15.2%	9.6%	20.7%	13.8%	13.6%	13.6%	18.5%	12.4%
Contacted members of local business community	8.0%	3.2%	11.3%	6.8%	6.9%	7.7%	9.4%	7.4%
Other similar type of activity	1.7%	1.7%	.4%	1.1%	4.0%	1.8%	2.2%	.5%
Activities since attending TEP								
Made presentations to other teachers outside of my school	43.7%	42.4%	54.0%	45.8%	47.7%	35.1%	42.4%	44.3%
Served as mentor to other teachers within my school	60.2%	78.7%	63.1%	54.4%	63.9%	49.8%	59.8%	69.0%
Served as mentor to other teachers outside my school	28.7%	24.6%	35.5%	25.7%	33.6%	25.8%	29.3%	25.1%
Organized in-service activity within my school	23.2%	25.2%	29.7%	24.4%	29.1%	17.3%	23.9%	17.8%
Organized in-service activity outside my school	23.6%	24.0%	25.7%	21.2%	33.7%	22.6%	23.1%	15.9%
Made a presentation at a professional meeting	33.1%	37.9%	43.1%	30.9%	32.9%	28.3%	35.8%	27.5%
Served as staff member in summer program	17.1%	26.2%	23.4%	14.1%	16.4%	14.6%	18.7%	12.5%
Appointed as team leader, chair, or mentor	27.3%	25.4%	27.5%	28.3%	40.4%	21.4%	22.3%	30.8%
Wrote for professional publications	14.3%	20.3%	14.3%	13.6%	16.0%	12.6%	14.7%	13.2%
Used a computer network to maintain contacts	11.7%	9.0%	15.9%	5.6%	13.6%	10.0%	13.6%	11.9%
Contacted someone at a college or university	33.7%	33.4%	38.8%	24.1%	42.9%	29.3%	36.6%	30.5%
Contacted members of local business community	25.0%	15.7%	31.1%	23.3%	34.4%	20.6%	21.8%	26.8%
Other similar type of activity	2.3%	3.5%	1.7%	1.0%	.6%	2.7%	4.1%	1.5%

Table 17. Number of teachers influenced by Teacher Enhancement Program participants, by year

Number of teachers attending activities at which TEP participants presented information	All years	1984	1985	1986	1987	1988	1989	1990
Made presentations within my school								
Median	10	10	10	20	15	10	10	10
Mean	24.0	21.9	28.0	32.0	25.8	24.0	20.9	18.5
Standard Deviation	33.5	42.6	36.3	44.7	29.0	33.8	29.4	24.4
Made presentations outside my school								
Median	40	50	35	40	60	60	35	32
Mean	109.1	179.8	72.2	110.9	112.2	170.4	73.9	100.6
Standard Deviation	192.4	284.3	103.3	252.4	154.9	243.2	149.6	170.2
Served as mentor within school								
Median	5	5	5	5	6	5	4	5
Mean	8.9	7.7	7.2	14.4	11.3	8.3	7.3	8.2
Standard Deviation	16.4	10.6	16.5	34.8	13.6	12.3	13.3	9.6
Served as mentor outside my school								
Median	10	12	4	10	10	15	6	7
Mean	22.0	37.7	15.4	24.8	20.2	30.6	15.0	26.6
Standard Deviation	59.5	90.7	65.6	35.5	24.8	64.3	38.9	96.2
Organized workshop within my school								
Median	20	25	12	20	24	20	15	25
Mean	28.5	31.3	32.8	33.8	31.3	29.5	19.9	26.2
Standard Deviation	38.1	26.4	45.2	62.3	31.7	34.8	30.6	18.0
Organized a workshop outside my school								
Median	35	60	50	50	25	40	30	20
Median	40	36	50	40	55	75	30	36
Mean	71.3	148.2	81.3	97.3	68.3	73.5	54.0	34.4
Standard Deviation	123.6	174.5	85.8	227.2	93.7	117.3	105.2	43.4
Made presentation at professional meeting								
Median	40	36	50	40	55	75	30	36
Mean	104.7	108.6	125.7	83.5	107.6	171.7	53.4	90.4
Standard Deviation	215.1	139.5	377.3	197.3	140.2	243.4	80.0	137.3
Served in summer program								
Median	30	25	30	40	30	30	30	20
Mean	43.6	75.6	43.0	55.7	40.7	43.7	39.7	30.1
Standard Deviation	57.3	109.1	40.6	51.1	38.6	76.3	47.9	26.8

Table 18. Perceptions of district or school system support, by year

Indicate the extent you feel each statement is true for your school district	All years	1984	1985	1986	1987	1988	1989	1990
School system has comprehensive plan								
Not at all true	12.2%	6.3%	16.8%	9.3%	13.7%	13.4%	10.1%	12.0%
...	11.4%	11.0%	11.6%	10.4%	14.1%	8.7%	13.0%	11.5%
Somewhat true	29.6%	47.8%	31.0%	30.1%	26.2%	35.8%	24.9%	22.0%
...	21.9%	20.2%	15.0%	24.7%	18.3%	22.1%	25.0%	24.6%
Very true	22.8%	13.5%	24.4%	24.6%	26.2%	17.7%	21.7%	29.4%
Don't know	2.3%	1.2%	1.3%	1.0%	1.4%	2.3%	5.3%	.5%
Administrators encourage hands-on methods								
Not at all true	5.3%	2.5%	9.7%	7.3%	4.3%	4.5%	4.8%	3.7%
...	7.9%	6.2%	5.4%	6.7%	8.9%	9.4%	6.8%	10.0%
Somewhat true	19.3%	29.7%	20.3%	24.4%	14.0%	19.1%	20.5%	14.3%
...	24.2%	24.5%	20.6%	26.2%	22.4%	25.7%	25.6%	23.2%
Very true	41.8%	37.1%	43.5%	35.3%	49.7%	40.5%	39.0%	45.5%
Don't know	1.5%		.4%	.1%	.8%	.8%	3.3%	3.4%
I have a lot of flexibility to choose topics								
Not at all true	7.1%	4.3%	4.8%	9.4%	3.6%	11.8%	6.9%	4.5%
...	7.7%	3.3%	7.5%	3.8%	11.1%	3.9%	10.5%	10.7%
Somewhat true	16.7%	20.0%	12.3%	24.2%	18.3%	16.4%	18.3%	10.4%
...	18.5%	21.9%	21.0%	13.8%	16.7%	17.6%	20.8%	18.2%
Very true	49.5%	48.7%	54.0%	48.8%	50.4%	48.7%	43.1%	56.2%
Don't know	.6%	1.7%	.3%			1.6%	.5%	
I have resources I need to use hands-on methods								
Not at all true	5.2%	2.0%	1.2%	6.3%	5.2%	4.5%	7.6%	6.5%
...	7.9%	5.1%	9.5%	10.6%	9.0%	3.5%	10.8%	7.0%
Somewhat true	29.8%	25.4%	24.3%	23.8%	35.6%	36.7%	27.9%	27.3%
...	26.7%	19.5%	32.1%	25.6%	24.3%	27.6%	27.7%	24.7%
Very true	29.9%	45.3%	32.5%	33.7%	25.9%	27.6%	25.1%	34.4%
Don't know	.4%	2.6%	.4%	.1%		.1%	.9%	.2%
The principal supports improved teaching methods								
Not at all true	4.8%	1.3%	6.0%	7.5%	5.9%	2.4%	4.8%	5.5%
...	6.0%	3.8%	4.4%	5.0%	8.4%	7.8%	3.1%	8.5%
Somewhat true	13.1%	19.6%	9.1%	12.1%	8.6%	16.4%	14.1%	13.2%
...	20.3%	25.5%	25.6%	19.9%	15.3%	17.4%	23.1%	18.9%
Very true	53.5%	47.0%	51.8%	53.7%	61.2%	55.8%	48.2%	53.9%
Don't know	2.3%	2.6%	3.0%	1.7%	.5%	.2%	6.7%	
School system strongly encouraged me to attend TEP								
Not at all true	18.1%	33.9%	20.3%	22.5%	19.3%	14.2%	18.6%	11.4%
...	13.0%	10.0%	14.0%	22.2%	13.6%	14.4%	8.9%	9.3%
Somewhat true	17.6%	10.0%	22.6%	12.2%	16.1%	17.1%	21.8%	16.0%
...	17.1%	16.4%	9.5%	25.2%	16.6%	15.7%	19.2%	17.2%
Very true	31.1%	28.8%	29.2%	16.8%	31.4%	33.6%	27.9%	45.4%
Don't know	3.1%	.9%	4.4%	1.2%	3.0%	5.0%	3.6%	.6%
School system obtained financial support for TEP								
Not at all true	49.1%	63.6%	57.3%	63.8%	46.9%	44.1%	43.7%	44.3%
...	8.0%	5.0%	11.8%	10.5%	2.2%	5.6%	9.1%	11.7%
Somewhat true	6.1%	12.8%	7.6%	5.7%	7.2%	3.3%	6.4%	6.0%
...	7.5%	5.1%	4.7%	5.4%	9.2%	8.6%	9.5%	6.2%
Very true	25.0%	10.3%	16.9%	12.7%	31.5%	32.6%	24.0%	29.9%
Don't know	4.1%	3.2%	1.8%	1.9%	3.1%	5.7%	7.3%	1.9%
My district provided support for using TEP ideas								
Not at all true	12.4%	9.7%	13.7%	21.3%	10.0%	9.8%	12.4%	11.9%
...	12.8%	6.6%	8.6%	8.9%	14.9%	15.9%	14.3%	12.0%
Somewhat true	19.7%	10.5%	21.9%	24.6%	22.9%	21.5%	16.3%	16.5%
...	25.7%	42.7%	24.2%	28.0%	28.3%	19.9%	26.7%	24.4%
Very true	26.8%	27.2%	27.8%	14.6%	23.0%	29.7%	26.5%	34.6%
Don't know	2.6%	3.3%	3.8%	2.6%	.9%	3.1%	3.8%	.6%

Table 18, continued

Indicate the extent you feel each statement is true for your school district	All years	1984	1985	1986	1987	1988	1989	1990
I have release time to lead in-service activities								
Not at all true	42.5%	51.8%	45.8%	49.3%	46.0%	37.3%	42.7%	34.9%
...	9.1%	5.5%	7.7%	8.5%	11.4%	7.8%	7.0%	14.9%
Somewhat true	9.1%	7.5%	11.4%	12.2%	4.5%	8.3%	7.2%	13.6%
...	6.8%	4.5%	4.7%	4.2%	12.2%	7.4%	7.2%	4.7%
Very true	12.8%	3.6%	17.0%	10.7%	13.1%	13.5%	9.7%	17.3%
Don't know	19.7%	27.0%	13.4%	15.1%	12.8%	25.6%	26.1%	14.6%
I have adequate materials and supplies for in-service								
Not at all true	33.2%	25.9%	42.5%	37.5%	39.1%	27.2%	30.5%	31.0%
...	12.5%	5.2%	10.8%	13.4%	13.7%	11.2%	13.1%	15.9%
Somewhat true	12.7%	22.2%	15.3%	19.3%	8.4%	11.4%	9.3%	13.3%
...	11.3%	14.0%	4.9%	8.3%	12.9%	13.3%	13.1%	11.3%
Very true	9.0%	3.7%	11.9%	6.6%	11.5%	8.2%	7.1%	11.5%
Don't know	21.4%	29.0%	14.6%	14.9%	14.4%	28.8%	26.9%	17.0%

Table 19. Characteristics at the time of Teacher Enhancement Program participation, by year

	All years	1984	1985	1986	1987	1988	1989	1990
Were you a teacher when you first enrolled in TEP?								
Yes	98.3%	97.6%	100.0%	98.4%	99.1%	96.9%	99.0%	97.3%
No	1.7%	2.4%		1.6%	.9%	3.1%	1.0%	2.7%
How many years of teaching experience had you had?								
Mean	14.5	14.7	16.0	15.9	14.3	13.0	14.5	14.7
Standard Deviation	7.8	6.2	7.5	7.4	7.7	7.7	8.1	8.2
At what grade level were you teaching?								
Single grade	26.6%	25.8%	13.4%	27.1%	22.1%	30.5%	30.0%	32.0%
Kindergarten	1.2%		.5%	1.6%	2.2%	.4%	1.1%	2.1%
First grade	1.8%	1.4%	.7%	6.6%	1.7%	.6%	1.7%	1.1%
Second	3.4%	.4%	.1%		4.3%	7.9%	1.8%	4.9%
Third	2.1%	1.0%	.3%	.8%	1.2%	2.7%	1.9%	5.8%
Fourth	2.7%	.9%	.7%	.5%	.1%	3.9%	6.5%	1.7%
Fifth	2.9%	.4%	1.4%	1.5%	2.2%	6.2%	3.8%	.4%
Sixth	4.1%	1.8%	.7%	10.8%	1.6%	3.8%	4.9%	4.3%
Seventh	2.2%	1.9%	3.0%	.9%	1.3%	2.0%	1.7%	4.3%
Eighth	2.4%	4.1%	1.7%	3.1%	1.6%	2.2%	3.4%	1.5%
Ninth	2.0%	8.5%	2.7%	.1%	4.2%	.3%	2.5%	.5%
Tenth	.9%	4.5%	1.3%	.1%	1.4%	.1%	.6%	.9%
Eleventh	.6%				.3%		.0%	3.9%
Twelfth	.4%	1.1%	.3%	1.1%	.1%	.2%	.2%	.5%
K or 1 thru 8	.4%		.1%	.5%	.2%	.2%	.7%	.8%
9 thru 12	21.4%	18.5%	24.5%	19.2%	20.0%	19.8%	24.8%	20.2%
10 thru 12	15.7%	13.7%	27.3%	18.7%	18.7%	14.1%	9.7%	11.3%
11 and 12	5.4%	9.9%	6.5%	4.6%	8.6%	2.4%	6.0%	3.8%
All other combinations *	30.5%	32.1%	28.1%	29.8%	30.3%	32.9%	28.9%	31.8%
Kindergarten	2.9%	2.9%	3.3%	6.4%	2.3%	2.1%	1.1%	4.5%
First grade	4.2%	4.5%	3.5%	7.6%	6.9%	2.6%	2.0%	4.9%
Second	5.7%	3.7%	3.8%	11.2%	8.0%	5.1%	3.1%	6.0%
Third	5.8%	9.4%	.5%	11.6%	6.1%	4.9%	5.1%	7.0%
Fourth	7.1%	9.2%	7.1%	8.9%	7.1%	6.3%	6.4%	7.3%
Fifth	8.3%	10.1%	6.3%	10.5%	8.0%	7.2%	8.0%	9.9%
Sixth	10.0%	5.0%	7.0%	9.3%	8.4%	14.5%	11.7%	7.6%
Seventh	12.9%	14.7%	7.4%	9.8%	14.1%	17.2%	15.2%	8.8%
Eighth	12.9%	13.1%	7.6%	10.7%	16.1%	16.9%	14.6%	7.4%
Ninth	8.4%	8.1%	12.0%	3.3%	12.4%	8.5%	4.9%	10.3%
Tenth	4.5%	2.8%	7.8%	1.6%	3.8%	4.3%	3.6%	6.9%
Eleventh	2.6%	2.5%	2.1%	2.0%	4.1%	2.4%	1.7%	3.8%
Twelfth	2.7%	3.3%	2.2%	.3%	3.2%	1.8%	1.3%	7.8%

* "All other combinations" lists teachers who indicated teaching two or more grades in some combination other than those listed immediately above. Each mentioned grade is counted as one entry. Therefore, sum of percentages exceeds the total percentage for this category.

Table 20. Participant work allocation prior to Teacher Enhancement Program, by year

What proportion of a typical work week was spent on each of the following subjects?	All years	1984	1985	1986	1987	1988	1989	1990
Self-contained math/science class								
Mean	14.9	13.1	9.2	16.9	17.6	14.8	17.6	12.8
Standard Deviation	33.6	32.8	28.2	35.0	36.7	33.0	35.5	31.0
Mathematics								
Mean	18.6	11.4	11.6	15.7	16.9	25.6	21.3	17.1
Standard Deviation	32.8	26.4	26.7	30.3	31.9	36.0	35.4	31.4
General or Physical Science								
Mean	8.9	15.8	7.5	12.5	8.6	7.2	8.3	8.9
Standard Deviation	20.4	30.8	17.6	25.9	20.7	16.2	19.0	20.1
Biology								
Mean	11.2	14.4	23.3	7.7	10.4	10.7	8.7	7.0
Standard Deviation	25.4	29.1	36.4	19.4	25.2	23.6	22.4	18.3
Chemistry								
Mean	12.9	8.9	19.0	12.3	15.6	11.4	9.9	13.4
Standard Deviation	27.7	23.6	32.4	26.2	30.2	27.7	23.8	27.6
Physics								
Mean	5.9	8.3	6.7	6.0	6.5	2.8	6.4	7.2
Standard Deviation	17.3	19.9	17.4	16.3	17.3	11.3	19.9	19.3
Earth, Ocean or Atmospheric Science								
Mean	5.2	7.5	4.8	2.8	3.8	4.5	7.3	6.1
Standard Deviation	16.7	21.0	14.3	12.0	12.3	15.9	19.1	20.3
Ecological or Environmental Sciences								
Mean	1.5	.9	2.3	1.7	1.7	.7	1.2	1.9
Standard Deviation	5.9	3.0	9.5	5.2	5.6	3.3	5.7	6.3
Geography								
Mean	.6	1.0	.3	.6	.2	1.2	.4	.4
Standard Deviation	3.6	3.3	2.3	2.9	1.3	6.2	1.8	3.5
Computer Science								
Mean	1.9	1.1	2.5	2.4	1.3	1.6	2.0	1.8
Standard Deviation	8.1	4.2	10.5	8.1	6.4	8.0	8.3	8.1
Health Science								
Mean	1.1	1.2	1.0	1.6	.7	1.0	1.2	1.5
Standard Deviation	5.1	5.7	4.8	6.3	4.6	4.9	5.3	4.4
Other Science								
Mean	1.6	.1	3.0	1.9	1.1	1.5	1.4	1.4
Standard Deviation	9.1	1.2	13.7	10.5	6.9	7.7	8.5	8.2
Social Studies								
Mean	2.2	1.4	.9	1.7	2.9	1.2	1.9	5.6
Standard Deviation	10.8	3.9	6.3	8.2	14.6	5.5	8.0	19.1
Administration								
Mean	2.2	1.3	2.0	5.1	2.3	1.8	1.9	1.3
Standard Deviation	9.1	4.3	5.7	20.4	7.3	6.1	6.8	5.7
Non-Science or Math Subjects								
Mean	6.8	5.7	2.1	5.9	5.6	9.8	6.1	10.1
Standard Deviation	18.4	17.6	10.7	15.9	17.9	21.8	17.1	21.3
Non-Teaching Activity								
Mean	4.3	6.0	4.0	5.1	4.4	4.1	4.4	3.8
Standard Deviation	9.6	10.0	9.2	9.9	8.5	8.6	11.4	8.8

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Table 21. Teaching status at time of Teacher Enhancement Program enrollment, by year\

Describe your teaching status when you enrolled in TEP	All years							
		1984	1985	1986	1987	1988	1989	1990
Pre-service teacher	4.1%	2.6%	6.2%	7.6%	2.1%	5.5%	2.6%	2.0%
In-service teacher (under-prepared)	20.4%	17.4%	11.5%	24.2%	19.3%	23.4%	19.9%	24.2%
In-service teacher (well-prepared)	56.9%	64.2%	59.9%	46.7%	65.5%	61.4%	53.3%	50.3%
Expected to assume leadership in district	38.0%	34.4%	50.1%	28.0%	44.6%	26.9%	42.7%	39.2%
Expected state or national leader	5.6%	1.3%	8.0%	2.1%	7.2%	5.6%	7.0%	4.2%
Regular teacher (not further specified)*	3.8%	6.9%	.1%	4.8%	1.9%	3.6%	5.5%	5.2%

Note: multiple responses were permitted; therefore, sum exceeds 100%.

* Respondent wrote in "regular teacher."

Table 22. Characteristics of the school where participants were teaching at the time of Teacher Enhancement Program enrollment, by year

	All years	1984	1985	1986	1987	1988	1989	1990
Location								
City	34.5%	29.4%	37.5%	44.6%	26.0%	28.4%	36.8%	39.8%
Suburban	33.8%	51.6%	38.9%	30.2%	38.0%	23.2%	37.4%	32.5%
Rural	31.7%	19.0%	23.6%	25.2%	35.9%	48.4%	25.7%	27.7%
Type								
Public	92.2%	94.5%	93.8%	92.5%	90.9%	93.2%	92.8%	88.7%
Private	7.8%	5.5%	6.2%	7.5%	9.1%	6.7%	7.2%	11.3%
Mixed	.0%					.1%		
Students eligible for reduced price lunches								
0 to 25%	49.8%	68.6%	59.8%	51.7%	58.6%	35.6%	47.6%	49.8%
26% to 50%	26.7%	19.4%	24.7%	17.1%	23.2%	35.1%	31.5%	21.8%
51% to 75%	13.3%	6.9%	9.0%	8.9%	13.1%	19.7%	9.8%	18.7%
76% to 100%	10.1%	5.1%	6.5%	22.3%	5.1%	9.6%	11.1%	9.7%
Student body composition: Percent who were:								
White, not Hispanic								
Mean	71.1	72.8	74.0	62.9	78.8	74.5	65.8	69.4
Standard Deviation	31.5	30.1	28.7	36.0	25.8	32.1	32.3	30.3
Black, not Hispanic								
Mean	16.6	14.2	13.3	21.3	12.2	15.5	20.8	16.7
Standard Deviation	25.7	26.2	19.5	29.1	20.7	25.7	29.2	25.2
Hispanic								
Mean	8.3	9.5	8.3	13.5	5.7	6.4	7.6	10.1
Standard Deviation	17.9	18.2	19.4	25.5	13.9	16.4	14.2	18.9
Asian or Pacific Islander								
Mean	2.8	3.2	3.0	2.3	2.4	2.0	3.8	2.7
Standard Deviation	6.9	4.0	8.8	6.5	6.3	6.6	6.7	7.0
American Indian/Alaskan Native								
Mean	1.2	.4	1.1	.6	.8	1.6	1.7	.9
Standard Deviation	7.1	1.0	5.3	3.4	3.6	9.8	9.9	3.2
Other								
Mean	.2	.1	.4	.2	.1	.2	.2	.0
Standard Deviation	2.1	.8	5.0	.8	.8	1.3	1.7	.8

Table 23. Current status of Teacher Enhancement Program participants, by year

	All years							
What is your current employment status?		1984	1985	1986	1987	1988	1989	1990
Classroom teacher in grades K-12	86.4%	76.9%	81.1%	84.9%	86.4%	86.5%	88.2%	92.8%
Teaching position outside of grades K-12	2.2%	2.6%	3.0%	1.7%	1.1%	2.5%	2.8%	1.6%
Preschool	.1%				.2%			.2%
College, including Jr. College	1.6%	.1%	3.0%	1.1%	1.0%	1.5%	2.3%	.8%
Tutoring / home bound children	.3%	1.7%				1.0%		
Remedial ed.	.1%						.3%	
Gifted education / enrichment education	.0%					.0%		
Other than classroom teaching	.2%	.7%		.6%			.2%	.6%
Type of school/employer								
College or University	1.1%	.1%	2.6%	1.1%	.3%	.1%	2.0%	.9%
Jr. college	.6%		.4%	.2%	.8%	1.4%	.2%	.2%
Special school	.5%	1.7%		.4%		1.0%	.5%	.6%
Other than classroom teaching	.0%						.0%	
A non-teaching position in an educational organization	4.7%	4.6%	6.8%	5.1%	7.4%	3.8%	4.5%	1.7%
Employed in an occupation outside of education	1.5%	3.2%	.5%	1.6%	.3%	3.3%	1.6%	.1%
Not presently employed	5.1%	12.8%	8.7%	6.7%	4.8%	3.8%	2.9%	3.9%

Table 23A. Participants who left teaching, by year

	All years							
		1984	1985	1986	1987	1988	1989	1990
In what year did you leave K-12 teaching?								
Prior to 1986	3.4%	16.6%		5.6%	2.4%		1.6%	3.6%
1986	2.3%	2.3%	6.1%	7.8%			.3%	
1987	4.0%	4.6%	3.5%	22.4%				
1988	12.1%	5.5%	30.1%	8.5%	4.9%	1.9%	25.4%	
1989	20.3%	10.7%	33.2%	32.1%	10.0%	16.1%	22.4%	9.3%
1990	23.6%	25.0%	11.8%	7.7%	53.8%	21.8%	34.7%	13.0%
1991	33.2%	35.2%	11.9%	15.9%	28.9%	59.8%	15.3%	69.3%
1992	1.1%		3.5%			.3%	.3%	4.7%
Why did you decide to leave K-12 teaching?								
Health or disability	19.9%	6.8%	21.1%	28.7%	3.1%	18.7%	35.2%	7.7%
Retirement	37.7%	70.3%	70.4%	28.1%	49.9%	17.9%	1.3%	60.3%
Laid off	6.6%		3.3%	3.9%		1.0%	27.1%	3.4%
To teach at college level	6.9%	.7%		3.0%	5.1%	.8%	27.2%	8.0%
To take an administrative job (in a school)	3.0%	6.1%		2.5%		.6%	5.7%	10.6%
Low salary	1.6%				5.3%	.8%	.8%	8.1%
Burnout / could not take the pressure	12.7%	7.2%	4.8%	22.0%	12.5%	28.4%	2.7%	4.2%
Too little support from administrators / colleagues	9.1%	4.1%	6.1%	8.2%	1.8%	22.1%	4.9%	6.5%
Moved & could not find teaching job	.4%						2.0%	
Returned to school	11.9%	1.4%	.5%	10.6%	24.0%	9.4%	29.6%	4.5%
Other reasons	3.6%			1.3%		1.3%	16.9%	
Other comments	.4%	4.1%						

Note: question was asked of all who said they were no longer teaching K-12. (Table 23, above)
This ranged from 23% of respondents in 1984 to 7% in 1990.

Table 24. Current teaching assignment of Teacher Enhancement Program participants, by year

	All years	1984	1985	1986	1987	1988	1989	1990
At what grade levels do you now teach?								
Single grade	34.0%	31.7%	18.3%	35.4%	30.5%	40.5%	38.1%	33.7%
Kindergarten	1.1%		.3%	1.8%	.9%	.4%	1.2%	2.6%
First grade	2.1%	1.7%	1.0%	2.5%	1.9%	2.9%	1.8%	1.9%
Second grade	4.0%	8.1%	.1%	.9%	5.4%	6.8%	2.7%	4.9%
Third grade	3.4%	.5%	1.3%	6.0%	1.0%	4.6%	2.3%	6.1%
Fourth grade	4.7%	.9%	4.8%	4.4%	5.7%	5.2%	6.0%	2.8%
Fifth grade	3.2%	2.0%	1.2%	3.5%	2.5%	4.8%	4.1%	2.1%
Sixth grade	4.4%	.4%	.8%	11.6%	2.9%	3.9%	5.3%	4.1%
Seventh grade	3.5%	5.8%	1.4%	1.7%	3.1%	4.7%	5.5%	1.2%
Eighth grade	3.3%	5.4%	2.3%	1.1%	1.4%	4.9%	4.4%	3.0%
Ninth grade	2.5%	1.0%	4.3%	.3%	4.8%	1.8%	2.2%	2.2%
Tenth grade	.8%	5.6%	.7%	.8%	.1%	.2%	.5%	1.0%
Eleventh grade	.4%						1.4%	.8%
Twelfth grade	.6%	.4%	.2%	.9%	.8%	.1%	.8%	1.0%
K or 1 thru 8	.5%		.4%	.6%		.2%	.9%	1.0%
9 thru 12	21.4%	25.6%	27.9%	19.4%	22.3%	18.9%	21.6%	18.9%
10 thru 12	15.7%	17.1%	25.1%	16.8%	19.9%	11.1%	12.1%	15.2%
11 and 12	6.5%	11.9%	5.9%	3.9%	10.4%	3.4%	6.5%	7.9%
All other combinations *	21.9%	13.6%	22.5%	23.9%	16.9%	25.9%	20.8%	23.4%
Kindergarten	2.1%	1.3%	.2%	7.9%	1.0%	1.2%	1.4%	3.1%
First grade	3.0%	1.5%	.2%	8.8%	1.8%	3.4%	2.3%	3.2%
Second grade	4.4%	1.5%	.3%	12.5%	1.8%	6.1%	3.8%	3.7%
Third grade	4.8%	2.5%	.3%	13.0%	1.5%	5.4%	4.0%	6.1%
Fourth grade	4.4%	2.5%	1.0%	13.2%	1.4%	4.1%	3.5%	5.6%
Fifth grade	5.4%	2.5%	2.1%	14.1%	1.5%	6.3%	4.4%	6.2%
Sixth grade	6.6%	5.1%	3.3%	7.0%	3.6%	10.3%	7.2%	6.0%
Seventh grade	8.8%	7.2%	13.7%	4.4%	5.7%	9.3%	10.6%	8.5%
Eighth grade	9.6%	8.1%	13.3%	4.9%	9.1%	12.4%	10.5%	5.9%
Ninth grade	6.7%	3.0%	11.9%	5.3%	9.0%	7.7%	4.9%	3.8%
Tenth grade	3.9%	1.8%	5.7%	1.0%	3.7%	4.7%	2.9%	5.7%
Eleventh grade	3.0%	3.0%	2.3%	3.9%	3.6%	3.2%	3.0%	2.4%
Twelfth grade	3.2%	4.8%	2.4%	3.1%	2.8%	3.0%	2.1%	5.3%

* "All other combinations" lists teachers who indicated teaching two or more grades in some combination other than those listed immediately above. Each mentioned grade is counted as one entry. Therefore, sum of percentages exceeds the total percentage for this category.

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Table 25. Current participant work allocation, by year

Approximately what percent of a typical work week do you now spend teaching each of the following subjects?	All years							
		1984	1985	1986	1987	1988	1989	1990
Self-contained math/science class								
Mean	12.8	5.0	9.6	13.1	15.2	13.6	14.6	11.9
Standard Deviation	31.2	19.6	29.2	31.1	35.2	30.2	32.9	29.9
Mathematics								
Mean	19.4	5.5	12.6	15.7	17.2	28.5	21.4	17.4
Standard Deviation	34.3	19.6	29.4	31.5	31.8	39.7	35.4	31.9
General or Physical Science								
Mean	7.9	12.4	6.3	9.9	7.3	6.8	7.6	9.4
Standard Deviation	18.8	21.2	19.5	20.6	16.8	17.0	18.0	21.0
Biology								
Mean	11.9	18.9	18.7	10.0	10.8	11.5	11.7	7.5
Standard Deviation	26.3	32.4	32.4	24.0	25.0	26.7	25.5	19.7
Chemistry								
Mean	13.0	19.1	19.1	12.4	13.4	9.7	11.3	13.4
Standard Deviation	27.5	31.9	32.5	26.0	27.2	25.5	25.4	27.4
Physics								
Mean	5.2	8.1	8.0	6.3	7.0	1.8	3.4	7.4
Standard Deviation	16.4	19.7	20.9	15.3	18.7	9.8	13.5	19.6
Earth, Ocean or Atmospheric Science								
Mean	5.1	9.8	4.6	1.7	5.2	4.6	8.0	3.1
Standard Deviation	16.2	22.7	14.2	8.2	14.3	17.2	20.4	11.4
Geography								
Mean	.4	.1	.2	.6	.5	.2	.3	.5
Standard Deviation	2.1	1.1	2.3	2.4	2.8	1.2	1.7	2.8
Ecological or Environmental Science								
Mean	1.6	1.5	2.4	2.3	1.8	.4	1.2	2.4
Standard Deviation	6.9	8.4	9.8	6.2	6.0	3.8	6.4	8.5
Computer Science								
Mean	1.9	1.4	2.1	1.0	1.5	2.1	2.4	1.6
Standard Deviation	9.9	6.8	9.7	4.1	7.1	13.0	11.0	8.8
Health Science								
Mean	1.0	.7	.9	.8	.6	.8	.9	1.8
Standard Deviation	4.6	4.6	4.5	4.1	4.2	4.6	4.2	5.6
Other Science (Specify):								
Mean	1.9	1.9	1.4	2.9	2.5	1.6	1.0	2.7
Standard Deviation	10.1	11.9	8.0	13.2	10.4	8.7	6.7	13.7
Social Studies								
Mean	2.8	2.6	1.6	1.5	2.4	3.0	2.5	5.4
Standard Deviation	11.9	6.8	10.0	6.8	10.1	11.9	9.4	19.2
Administration (e.g., department chair)								
Mean	2.3	1.6	2.3	1.4	5.1	1.7	2.2	2.0
Standard Deviation	9.0	6.5	6.5	7.9	15.5	6.6	7.5	9.0
Non-Science or Math Subjects								
Mean	7.8	4.0	3.6	15.9	3.5	8.5	7.2	10.1
Standard Deviation	19.9	16.6	13.4	31.6	13.5	17.8	19.3	20.8
Non-Teaching Activity								
Mean	5.0	7.4	6.6	4.9	6.2	4.6	4.1	3.9
Standard Deviation	9.7	10.1	10.3	8.7	12.0	9.8	8.9	8.4

Table 26. Current teaching status, by year

	All years							
		1984	1985	1986	1987	1988	1989	1990
Describe your current teaching status								
Pre-service teacher	2.6%	1.2%	4.6%	1.9%	4.0%	2.5%	2.6%	.5%
In-service teacher (under-prepared)	5.0%	1.4%	2.1%	4.2%	4.7%	8.0%	3.9%	6.1%
In-service teacher (well-prepared)	66.3%	73.6%	66.3%	53.6%	62.9%	73.0%	67.3%	65.4%
Expected to assume leadership in district	49.5%	43.1%	50.6%	52.9%	63.9%	41.4%	48.4%	48.3%
Expected state or national leader	11.3%	9.6%	10.8%	7.0%	16.4%	12.7%	11.2%	8.9%
Regular teacher (not further specified)	3.8%	.2%	1.1%	1.5%	3.6%	5.2%	3.7%	6.5%
Are you at the same school as when you enrolled in TEP?								
YES, but characteristics have changed	16.8%	36.9%	20.0%	14.7%	19.6%	15.5%	11.1%	17.4%
YES, and the characteristics are the same	68.2%	52.8%	55.8%	66.6%	67.5%	70.1%	73.2%	74.6%
NO	15.0%	10.2%	24.2%	18.6%	13.0%	14.4%	15.7%	8.0%

Table 27. Characteristics of current schools, by year (Respondents reporting changes only)

	All years	1984	1985	1986	1987	1988	1989	1990
Location								
City	38.7%	31.2%	37.0%	44.3%	28.1%	42.9%	33.9%	52.0%
Suburban	39.3%	43.7%	47.8%	34.7%	54.4%	21.8%	46.6%	31.7%
Rural	22.0%	25.1%	15.1%	20.9%	17.5%	35.3%	19.5%	16.3%
Type								
Public	94.4%	89.9%	96.6%	85.8%	94.4%	96.0%	94.8%	97.2%
Private	5.6%	10.1%	3.4%	14.2%	5.6%	4.0%	5.2%	2.8%
Students eligible for reduced price lunches								
0 to 25%	48.9%	68.3%	47.5%	59.6%	55.3%	35.4%	52.2%	42.9%
26% to 50%	25.2%	22.8%	34.3%	7.1%	18.9%	32.4%	24.2%	25.8%
51% to 75%	15.3%	5.6%	14.0%	10.4%	17.7%	24.1%	9.7%	17.4%
76% to 100%	10.6%	3.3%	4.3%	22.8%	8.1%	8.2%	13.9%	13.9%
Student body composition (percent)								
White, not Hispanic								
Mean	62.4	69.7	66.8	63.0	66.8	63.5	52.4	61.8
Standard Deviation	32.7	32.4	27.3	34.2	28.7	35.2	34.7	29.7
Black, not Hispanic								
Mean	21.0	17.3	18.9	23.2	22.9	19.0	23.2	22.3
Standard Deviation	26.9	31.2	20.1	30.6	26.9	24.0	30.6	27.3
Hispanic								
Mean	8.0	6.6	7.2	9.1	6.4	8.2	8.5	9.6
Standard Deviation	15.8	16.6	14.8	17.5	10.9	15.5	16.9	18.1
Asian or Pacific Islander								
Mean	3.8	5.0	4.1	3.1	2.3	2.3	5.8	4.1
Standard Deviation	8.7	6.0	10.9	5.8	3.9	5.6	11.7	10.6
American Indian/Alaskan Native								
Mean	1.4	.1	1.9	1.6	.4	.8	2.4	1.8
Standard Deviation	7.9	.4	10.6	7.0	1.5	5.6	11.3	6.8
Other								
Mean	.3	1.2	1.0	.1	.1	.1	.2	.1
Standard Deviation	3.9	2.1	9.4	.6	.8	.6	1.1	.5

Table 28. Barriers to applying content or methods, by year

Are there barriers to applying content or methods?	All years	1984	1985	1986	1987	1988	1989	1990
Yes	32.7%	18.9%	33.4%	39.0%	38.3%	26.7%	33.1%	34.8%
No	67.3%	81.1%	66.6%	61.0%	61.7%	73.3%	66.9%	65.2%
Please describe those barriers								
Lack of supplies / materials / funds	61.1%	42.2%	54.5%	52.6%	74.3%	64.0%	52.4%	71.9%
Inadequate facility: Lack of appropriate space for projects	14.7%	10.5%	26.2%	4.9%	10.6%	15.4%	21.9%	7.6%
Tight curriculum State course requirements too strict	8.8%	11.0%	15.9%	5.7%	4.5%	9.8%	8.6%	9.1%
Scheduling: class periods too short	4.0%	2.5%	.2%	2.8%	10.1%	6.7%	1.5%	2.6%
Other scheduling problems	4.2%	14.7%	2.0%	2.7%	7.9%	2.8%	4.3%	3.1%
Lack of administrative support	12.8%	18.8%	9.6%	18.7%	10.6%	14.6%	14.0%	7.9%
Lack of support from other teachers	7.2%	7.9%	1.8%	16.3%	7.8%	6.4%	7.2%	4.0%
Class size too large for hands on activities	5.8%		2.9%	12.4%	8.2%	.5%	7.4%	5.4%
Not enough time for teacher to work on new materials	9.7%	6.9%	5.6%	12.9%	9.3%	1.4%	20.8%	5.0%
Students not well enough prepared by previous grades	3.2%	.9%	3.2%	1.4%	.7%	2.3%	8.2%	1.1%
Changed teaching responsibilities or job	4.4%	28.2%	1.5%	14.3%	2.4%	.6%	3.0%	3.6%
Declining enrollment	.6%		.9%		.5%	1.7%		.7%
Disciplinary problem in classroom	1.0%			3.2%		.4%	2.0%	.3%

Note: barriers are summarized from respondents' own words. Multiple responses were accepted.

Table 29. Participant views on Teacher Enhancement Program participation by administrators, by year

	All years	1984	1985	1986	1987	1988	1989	1990
Should administrators participate in TEP?								
Yes	56.9%	50.5%	47.6%	52.8%	56.7%	58.0%	60.7%	59.8%
No	43.1%	49.5%	52.4%	47.2%	43.3%	42.0%	39.3%	40.2%
How should administrators be involved?								
Attend a project / as a participant	26.9%	24.4%	29.0%	22.6%	28.9%	29.5%	28.0%	21.7%
Introduction to what is available	20.4%	20.0%	11.0%	22.6%	17.5%	19.2%	20.9%	27.7%
Limited participation	15.9%	15.6%	23.0%	17.7%	13.2%	16.0%	13.7%	16.9%
They were involved / did attend	4.1%		2.0%	1.6%	4.4%	6.4%	4.4%	4.8%
Learn more about science and science education	35.0%	53.3%	35.0%	33.9%	34.2%	38.5%	31.8%	33.7%
Realize the importance of science education	20.9%	6.7%	15.0%	22.6%	24.6%	15.4%	24.6%	22.9%

Note: types of involvement are summarized from respondents' own words. Multiple responses were accepted.

Table 30. Assessment of Teacher Enhancement Program by participants with administrative responsibility, by year

	All years	1984	1985	1986	1987	1988	1989	1990
Do you have science/math administrative responsibilities								
Yes	62.2%	66.7%	70.6%	77.8%	72.7%	73.3%	42.9%	55.6%
No	37.8%	33.3%	29.4%	22.2%	27.3%	26.7%	57.1%	44.4%
What proportion of that administrative time is specific to science or math eduction?								
Mean	51.9	20.0	29.4	55.0	65.0	72.0	55.0	60.0
Standard Deviation	37.8	12.6	29.5	44.9	39.9	38.5	31.6	44.6
What are your administrative responsibilities?								
School principal / building principal	15.8%		33.3%	14.3%	12.5%		16.7%	40.0%
Chairperson of department	8.8%		22.2%	28.6%	12.5%			
Leader of teachers	49.1%	80.0%	44.4%	28.6%	62.5%	54.5%	58.3%	
Curriculum developer / coordinator / select texts	43.9%	20.0%	44.4%	42.9%	37.5%	54.5%	50.0%	40.0%
Order supplies / administer materials	10.5%	20.0%	11.1%			18.2%	8.3%	20.0%
Workshops with teachers	1.8%							20.0%
How did TEP participation affect your work?								
No (or very little) impact	3.8%		12.5%	14.3%				
Increased management or interpersonal skills	11.5%		12.5%	28.6%	16.7%		9.1%	20.0%
Increased knowledge of science education	25.0%		12.5%	14.3%	16.7%	60.0%	27.3%	20.0%
Increased knowledge of science	7.7%		12.5%		16.7%	10.0%		20.0%
Unspecified improvement:	34.6%	40.0%	25.0%	28.6%	16.7%	20.0%	63.6%	40.0%
Provided contacts / networking with other teachers	15.4%		25.0%		33.3%	10.0%	18.2%	20.0%
Lead to becoming mentor / lead teacher, etc.	13.5%	40.0%	25.0%		50.0%			
Led me to encourage staff to attend similar programs	9.6%	20.0%	12.5%	28.6%		10.0%		
What instructional changes would you favor?								
Change teaching style: more discussion / hands on	46.2%	41.7%	38.5%	47.2%	49.3%	41.6%	51.7%	43.6%
Increased access / use of computer / technology	18.5%	25.0%	17.3%	25.0%	14.1%	24.7%	14.8%	19.2%
Increased training for teachers	9.4%	25.0%		5.6%	12.7%	9.1%	8.7%	11.5%
Change curriculum / more science or math courses	19.3%	20.8%	19.2%	16.7%	9.9%	19.5%	22.1%	23.1%
Smaller class size	2.5%	4.2%	1.9%		2.8%	1.3%	2.7%	3.8%
More class time	2.9%		1.9%	5.6%	2.8%	3.9%	2.0%	3.8%
No changes	15.8%	8.3%	30.8%	16.7%	21.1%	13.0%	12.8%	11.5%
Other changes	1.8%		1.9%	5.6%	1.4%	3.9%	.7%	1.3%

Table 31. Participant career development since Teacher Enhancement Program, by year

Since you finished TEP have you achieved:	All years	1984	1985	1986	1987	1988	1989	1990
Subject area department head	40.7%	42.6%	54.2%	41.9%	48.6%	34.8%	31.3%	39.6%
Science or mathematics curricula specialist	25.4%	26.5%	22.6%	29.1%	21.8%	26.2%	29.7%	20.8%
Mentor-master teacher	46.8%	47.1%	38.7%	51.2%	51.4%	51.1%	48.4%	41.6%
Principal	3.5%	5.9%	4.5%	4.7%	1.4%	4.3%	3.1%	2.7%
Other administrative role within the district	8.0%	7.4%	9.0%	12.8%	8.5%	6.4%	6.6%	8.1%
Other	13.6%	17.6%	12.3%	10.5%	13.4%	11.3%	16.4%	12.8%
Have you taken courses for college credit in the past 5 years?	76.9%	81.5%	72.9%	73.7%	76.5%	77.0%	77.2%	80.1%
NUMBER OF COURSES IN:								
Science or mathematics content								
Mean	3.5	4.0	3.8	2.7	2.7	3.6	4.2	3.3
Standard Deviation	4.6	3.6	3.7	2.7	3.1	5.0	6.3	3.8
Methods for teaching science or mathematics								
Mean	1.9	1.0	2.1	2.1	1.8	1.8	1.8	2.0
Standard Deviation	3.8	1.9	7.7	3.7	2.9	2.7	2.9	2.8
SUBJECT MATTER OF COURSES								
Engineering (not specified)	.7%	3.2%	1.4%		.6%	1.0%		1.0%
Aeronautical or Astronautical	.6%		1.4%	2.1%	.6%	.5%	.3%	
Chemical	.2%	3.2%	.7%					
Electrical/Computers	1.1%	1.6%	2.1%		1.3%	1.5%	.8%	.5%
Industrial	.2%		.7%					.5%
Materials	.2%		.7%		.6%			.5%
Mechanical	.6%		1.4%		1.3%		.3%	1.0%
Mining	.3%	1.6%				.5%	.3%	.5%
Nuclear	.2%		.7%		.6%	.5%		
Petroleum	.2%					1.0%	.3%	
Other Engineering	.9%		1.4%		1.3%	.5%	.8%	1.5%
Physical Science	2.1%		1.4%	1.1%	1.9%	3.1%	2.2%	3.0%
Astronomy	5.9%	6.5%	5.6%	5.3%	6.3%	5.1%	4.4%	9.5%
Physics	13.9%	11.3%	19.0%	16.0%	14.5%	13.8%	7.8%	20.6%
Chemistry	15.6%	12.9%	25.4%	16.0%	16.4%	13.3%	10.3%	20.6%
Biochemistry	2.1%	4.8%	3.5%		3.1%	.5%	1.4%	3.5%
Other Physical Science	.9%	1.6%			1.3%		.8%	2.5%
Environmental Science	3.2%	3.2%	2.8%	2.1%	3.1%	4.6%	3.1%	3.0%
Atmospheric Science	1.7%		2.1%	1.1%		1.5%	2.2%	3.0%
Earth Science	10.0%	6.5%	11.3%	7.4%	6.3%	16.3%	8.6%	10.6%
Oceanography	3.5%	6.5%	2.8%	3.2%	2.5%	1.5%	4.4%	4.0%
Environmental studies/ecology	6.6%	11.3%	5.6%	6.4%	2.5%	6.6%	6.7%	9.0%
Other Environmental Science	.7%	1.6%	.7%		.6%			2.5%
Mathematical sciences	.6%		.7%		.6%		.8%	1.0%
Mathematics	7.5%	8.1%	6.3%	11.7%	6.3%	9.2%	6.9%	6.5%
Statistics	7.8%	4.8%	4.2%	2.1%	6.9%	6.6%	10.0%	12.1%
Other mathematics	16.3%	19.4%	14.8%	14.9%	17.6%	15.3%	17.2%	15.6%
Computer Science	19.7%	22.6%	18.3%	20.2%	20.1%	17.3%	20.0%	21.1%
Life sciences	.6%			1.1%		.5%	.8%	1.0%
Agricultural Science	.2%				.6%			1.0%
Biological Science	17.7%	24.2%	17.6%	14.9%	14.5%	21.4%	16.7%	18.1%
Biomedicine	1.3%	1.6%	.7%	3.2%	.6%	3.6%	.8%	
Health Care/Bloodbanking/Maternal & Child Care	1.4%	3.2%	.7%	1.1%		2.6%	1.9%	.5%
Other Life Science	.9%	1.6%	.7%	1.1%	1.9%	.5%	.3%	1.5%
Psychology	1.8%	1.6%	2.1%	2.1%	1.3%	3.6%	1.1%	1.5%
Social Science	.6%	1.6%			.6%		.8%	1.0%
Other Social Science	.3%		.7%		.6%		.3%	.5%
Medicine (ns)	.2%			1.1%			.3%	
Related Education (ns)	4.5%	4.8%	2.1%	6.4%	3.8%	7.7%	4.7%	2.5%
Engineering Education	.2%							1.0%
Mathematics Education	13.4%	8.1%	7.0%	13.8%	12.6%	12.2%	19.4%	10.1%
Science Education	16.3%	8.1%	14.8%	17.0%	16.4%	15.8%	18.9%	15.1%
Other	7.6%	8.1%	5.6%	4.3%	8.8%	7.7%	8.9%	7.0%
Other Sciences	2.7%	3.2%	2.1%	3.2%	3.8%	2.6%	2.2%	3.0%
Business/Management/Accounting/Finance	.2%					1.0%		
Education	1.2%	1.6%		1.1%	2.5%	1.5%	1.4%	.5%
English/Literature	.3%					.5%	.6%	.5%
Fine arts/Humanities	.4%				.6%	.5%	.8%	
Law	.1%		.7%					
Regional Studies	.1%						.3%	
Non-academic teaching skills	3.7%	3.2%	3.5%	3.2%	2.5%	6.6%	3.6%	2.5%
Communications/Journalism/Media	.2%			1.1%			.3%	.5%
All other responses	.2%			1.1%		.5%		
Number of courses in Fields other than science or mathematics								
Mean	4.1	6.2	4.1	4.5	6.1	3.8	3.0	3.2
Standard Deviation	8.6	13.5	9.2	10.3	10.3	6.9	7.5	6.0

Table 32. Participant education levels, by year

	All years							
		1984	1985	1986	1987	1988	1989	1990
What degrees do you hold?								
Bachelor's in Arts/Sciences	53.4%	48.5%	51.1%	54.5%	54.2%	53.9%	52.3%	57.3%
Bachelor's in Education	26.1%	23.1%	22.1%	18.7%	22.6%	30.4%	29.5%	26.3%
Master's in Arts/Sciences	27.4%	30.0%	38.1%	28.8%	26.9%	26.1%	24.4%	23.7%
Master's in Education	45.8%	53.1%	47.2%	48.0%	49.2%	45.3%	44.3%	41.6%
Ph.D., D.Sc.	1.5%	2.3%	2.6%	1.5%	1.7%	.8%	1.3%	1.1%
Ed.D.	.8%	.8%	1.6%	1.0%	.7%	.8%	.6%	.8%
Graduate courses, but no degree	31.7%	30.8%	26.4%	31.8%	30.0%	34.1%	33.0%	32.7%
Other	.3%		.3%			.3%	.4%	.6%
In what field was your highest earned degree? Major								
Agricultural Science	.8%		1.3%	1.0%	.7%	1.4%	.4%	.9%
Astronomy	.1%	.8%					.1%	
Atmospheric Sciences	.3%		.3%				.3%	1.2%
Biological Sciences	18.1%	28.5%	19.8%	19.6%	18.6%	20.3%	15.5%	14.2%
Chemistry	6.3%	3.1%	10.1%	6.7%	8.2%	4.8%	4.1%	8.4%
Computer Sciences	1.2%	.8%	2.0%		1.0%	.8%	1.9%	.6%
Geology	1.7%	2.3%	2.3%	.5%	1.7%	1.1%	1.6%	2.6%
Economics	.3%				.3%	.6%	.6%	.3%
Engineering	.4%		.3%		.3%	.8%	.1%	.9%
Mathematical Sciences	8.1%	6.2%	13.1%	6.7%	7.6%	5.9%	8.0%	8.4%
Medical Sciences	.3%				.3%	.3%	.3%	.9%
Oceanography	.2%			.5%		.3%	.3%	.3%
Physics	2.2%	1.5%	2.7%	6.2%	3.1%	1.4%	.9%	2.3%
Political Science	.4%		.3%		.3%	.6%	.6%	.6%
Psychology	1.9%	1.5%	1.3%	2.6%	.7%	2.0%	2.2%	2.3%
Sociology / Anthropology	1.7%	1.5%	1.0%		2.1%	1.7%	1.6%	3.2%
Science Education	10.6%	10.0%	12.4%	11.9%	12.4%	10.7%	8.1%	11.6%
Mathematics Education	9.8%	8.5%	8.7%	9.8%	7.6%	9.3%	12.9%	7.8%
Other Education	31.0%	30.0%	20.8%	30.4%	30.2%	34.1%	35.7%	29.0%
Business	.6%	.8%	.7%		.7%	.3%	.4%	1.2%
Fine arts	.8%		.3%	1.0%	1.7%	.8%	.6%	1.2%
Foreign languages	.3%		.3%	.5%		.6%	.4%	
History	1.2%		.7%	2.1%	1.4%	.8%	1.3%	1.4%
Library science	.0%		.3%					
English or literature	.8%	.8%	.3%		.3%	.6%	1.5%	.9%
Physical science	.0%					.3%		
Other Field	.6%	3.8%	.7%	.5%	.7%	.6%	.3%	
In what field was your highest earned degree? Minor								
Agricultural Science	.4%	1.1%			1.0%	.8%		.8%
Astronomy	.5%		.4%		1.0%	.4%	.4%	.8%
Atmospheric Sciences	.1%					.4%		
Biological Sciences	8.8%	7.5%	10.0%	6.8%	8.3%	8.0%	9.2%	10.1%
Chemistry	11.8%	10.8%	16.6%	13.6%	14.6%	10.8%	9.2%	10.1%
Computer Sciences	3.0%	4.3%	3.5%	4.5%	1.5%	4.0%	2.8%	2.0%
Geology	2.2%		2.2%	4.5%	2.4%	4.0%	1.5%	.8%
Economics	.2%			.8%		.8%		.4%
Engineering	.6%					.4%	1.1%	1.2%
Mathematical Sciences	7.2%	8.6%	8.7%	2.3%	9.7%	5.2%	7.2%	7.7%
Medical Sciences	.7%	1.1%	.9%		.5%		1.1%	.8%
Oceanography	.2%				.5%		.2%	.8%
Physics	6.5%	2.2%	11.4%	6.1%	7.3%	5.6%	3.7%	9.3%
Political Science	1.4%	1.1%	.9%	.8%	1.5%	1.2%	1.5%	2.4%
Psychology	3.7%	2.2%	1.7%	4.5%	4.9%	4.0%	3.9%	3.6%
Sociology / Anthropology	2.3%	2.2%	2.2%	2.3%	.5%	3.6%	1.7%	3.6%
Science Education	14.4%	26.9%	14.8%	15.9%	11.7%	12.8%	12.9%	14.9%
Mathematics Education	9.0%	7.5%	7.4%	8.3%	10.7%	8.4%	11.4%	6.5%
Other Education	18.9%	18.3%	14.0%	18.2%	19.4%	21.2%	21.6%	16.5%
Business	.9%	1.1%	.9%	.8%	1.9%	1.6%	.4%	
Fine arts	1.5%		1.3%	1.5%	1.0%	.8%	2.0%	2.4%
Foreign languages	1.2%	4.3%		.8%		2.0%	1.5%	.8%
History	1.2%		.4%	3.0%	.5%	1.6%	1.5%	1.2%
Library science	.2%		.4%				.4%	
English or literature	1.7%		.9%	2.3%	.5%	1.2%	3.1%	1.6%
Physical science	.6%			1.5%		.4%	1.1%	.4%
General science	.3%		.4%	.8%				1.2%
Other Field	.6%	1.1%	.9%	.8%	1.0%	.8%	.4%	

Table 33. Participant characteristics, by year

	All years							
		1984	1985	1986	1987	1988	1989	1990
What is your sex?								
Male	42.6%	43.5%	53.3%	49.0%	47.1%	34.3%	38.7%	42.2%
Female	57.4%	56.5%	46.7%	51.0%	52.9%	65.7%	61.3%	57.8%
What is your race/ethnicity?								
White, not of Hispanic origin	87.8%	87.7%	90.8%	89.3%	91.5%	88.2%	83.5%	89.3%
Black, not of Hispanic origin	7.9%	9.2%	7.2%	6.6%	4.8%	6.9%	11.0%	6.2%
Hispanic	1.7%	2.3%	.3%	2.5%	2.0%	1.1%	2.1%	1.4%
Asian or Pacific Islander	1.4%		1.3%	.5%	.7%	1.6%	1.6%	2.5%
American Indian or Alaskan Native	1.0%	.8%		.5%	.7%	1.9%	1.4%	.6%
Other	.3%		.3%	.5%	.3%	.3%	.3%	
Do you have a disability or handicap?								
No	97.0%	95.4%	96.7%	94.5%	97.3%	97.8%	97.1%	98.1%
Yes	3.0%	4.6%	3.3%	5.5%	2.7%	2.2%	2.9%	1.9%
Visual	21.6%	33.3%	20.0%	12.5%	60.0%	22.2%	7.1%	25.0%
Orthopedic (mobility)	45.1%	66.7%	20.0%	37.5%	20.0%	33.3%	71.4%	25.0%
Auditory (hearing)	13.7%		20.0%	12.5%		22.2%	7.1%	50.0%
Vocal	2.0%						7.1%	
Other	17.6%		40.0%	37.5%	20.0%	22.2%	7.1%	
How old are you?								
Mean	45.1	47.5	48.0	46.9	45.5	43.8	44.1	43.8
Standard Deviation	8.1	7.5	7.9	8.0	7.6	8.6	7.8	8.1

Table 34. Participants' general comments, by year

	All years							
		1984	1985	1986	1987	1988	1989	1990
What one aspect of TEP had greatest value?								
Increased subject knowledge, comfort	34.7%	40.2%	37.6%	27.1%	37.3%	36.8%	33.7%	32.2%
Hands on / laboratory experience / manipulatives	35.4%	27.5%	31.0%	36.8%	43.2%	37.9%	37.1%	29.3%
Interactions with other participants (teachers)	27.6%	24.5%	30.1%	23.6%	27.3%	26.8%	27.9%	29.0%
New teaching techniques, curriculum, methods	23.6%	25.5%	20.4%	27.1%	25.0%	22.5%	23.0%	24.6%
Community resources / visits to museums, zoo, businesses	1.7%	1.0%	1.3%	1.4%	1.4%	3.2%	1.5%	1.4%
Field trips	1.9%	2.0%	3.1%	4.2%	1.4%	1.8%	1.3%	1.4%
Renewal / increased enthusiasm for teaching science & math	6.8%	7.8%	5.3%	5.6%	7.7%	8.2%	6.0%	7.6%
Participating in on-going research	4.9%	6.9%	4.0%	3.5%	2.3%	5.7%	5.6%	5.4%
More or better resources (computers, supplies, space)	6.5%	6.9%	8.4%	7.6%	7.7%	5.4%	6.0%	5.1%
Discussions; increase interest in science or math	3.5%	1.0%	3.5%	4.9%	2.3%	3.9%	3.9%	3.6%
Other	.2%						.2%	1.1%
None	.2%	1.0%	.4%				.2%	
In what ways have your students benefited?								
Increased knowledge, confidence in subject matter	36.5%	40.2%	42.9%	33.6%	35.8%	37.0%	34.6%	35.5%
Improve demonstrations, manipulatives & hands-on activities	33.2%	34.0%	28.1%	41.6%	36.7%	30.8%	33.7%	31.2%
New teaching methods / curriculum / techniques	23.3%	21.6%	18.4%	20.1%	23.5%	22.1%	24.7%	27.7%
Use of community resources	.4%					.3%	1.3%	
Field trips	1.2%		1.8%	2.0%	.4%	1.7%	1.5%	
Increased my enthusiasm for teaching	15.5%	8.2%	15.2%	14.8%	17.7%	20.4%	13.5%	15.6%
Students exposed to "cutting edge" of science / math	4.9%	9.3%	7.4%	2.0%	4.0%	6.2%	3.8%	4.6%
More or better resources (computers, supplies, space)	8.6%	8.2%	9.2%	8.1%	10.6%	6.2%	8.7%	9.2%
Discussions; increase interest in science or math	33.0%	35.1%	29.0%	32.9%	29.6%	32.9%	34.0%	36.2%
Not used	2.6%	3.1%	1.8%	.7%	2.2%	2.8%	3.0%	3.5%
None	.8%		1.8%	.7%	.4%	.7%	.8%	.7%
Other	.6%		1.8%		1.3%	.3%	.2%	.4%
In your mind, is there a particular in-service education model that has great promise for enhancing teaching skills?								
Mention of specific model	35.4%	35.4%	37.2%	39.6%	38.7%	34.1%	30.8%	39.5%
Use of followup sessions	6.1%	7.7%	2.9%	5.5%	7.0%	4.5%	9.0%	3.6%
Long-term (more than 3 months)	1.8%	1.5%	2.2%	2.2%	.7%	2.3%	1.7%	1.8%
Hands-on	29.1%	38.5%	28.5%	30.8%	29.6%	31.3%	30.5%	19.2%
Cooperative learning groups	26.8%	26.2%	25.5%	20.9%	21.8%	25.6%	30.5%	29.3%
No. No single model is effective for everyone	10.2%	3.1%	13.9%	11.0%	8.5%	11.9%	8.1%	13.8%
Other	4.4%	1.5%	5.1%	4.4%	4.9%	5.7%	3.5%	4.8%

Note: Responses are summarized from respondents' own words. Multiple responses were accepted.

Table 35. Participants' suggestions, by year

	All years							
		1984	1985	1986	1987	1988	1989	1990
What changes would you like to see in TEP?								
Follow up	8.7%	13.4%	6.8%	9.4%	10.3%	6.3%	10.5%	6.0%
More input by, or time with, other participants	9.7%	11.9%	6.8%	6.6%	7.9%	8.1%	10.0%	14.8%
Better facilities / food / lodging / air conditioning	2.3%		1.2%	2.8%	3.6%	5.0%	1.2%	1.9%
Require less time - fewer weeks or sessions	3.7%	1.5%	3.7%	5.7%	3.0%	6.3%	2.7%	3.2%
Should be longer - more weeks or sessions	6.7%	4.5%	6.8%	7.5%	8.5%	5.4%	6.8%	6.5%
Improved staff	4.1%	3.0%	3.7%	5.7%	7.3%	4.1%	2.7%	4.2%
Better pay for participants	2.0%		1.2%	.9%	2.4%	2.3%	3.7%	
More field trips, experiments, labs, or hands on	9.1%	11.9%	7.5%	7.5%	9.1%	7.2%	8.8%	12.5%
More social activities for participants	.7%		1.9%	.9%	1.2%		.7%	.5%
More classroom focus	1.6%	1.5%	.6%	.9%	1.8%	2.3%	2.2%	.9%
Fewer lectures, fewer guest speakers	3.3%	3.0%	1.9%	1.9%	4.2%	3.2%	2.7%	5.6%
Make awards earlier	.1%							.5%
More on integrating math & science	3.5%	4.5%	4.3%	3.8%	4.2%	1.8%	3.7%	3.2%
Less intense sessions	5.9%	4.5%	6.8%	2.8%	5.5%	7.2%	5.9%	6.5%
Change in course content, not further specified	17.0%	7.5%	18.0%	20.8%	11.5%	16.7%	18.6%	19.0%
Smaller groups / more small group	1.8%	4.5%	.6%		3.6%	.5%	2.4%	1.4%
Better learning facilities	3.7%	4.5%	2.5%	4.7%	2.4%	2.7%	3.4%	6.5%
Ability to earn credit	1.3%		.6%	1.9%	1.8%	1.4%	1.5%	1.4%
Involve administration, school, or district	2.4%	1.5%	3.1%	2.8%	3.0%	2.7%	2.2%	1.4%
Improve program coordination	5.8%	10.4%	3.7%	1.9%	4.2%	7.2%	6.1%	6.9%
None	26.2%	26.9%	30.4%	32.1%	28.5%	31.2%	23.0%	19.0%
Other	4.5%	9.0%	6.2%	2.8%	2.4%	5.4%	4.4%	3.2%
Other comments about TEP								
Generalized positive comment	48.6%	43.5%	48.4%	51.2%	54.1%	44.9%	49.1%	47.6%
Professional benefit / growth / changed or enhanced teaching	30.3%	28.2%	31.9%	34.7%	30.1%	28.8%	29.5%	30.7%
More followup on participants	3.5%	4.7%	5.5%	2.5%	2.7%	2.5%	4.1%	2.6%
Keep funding or increase program	11.0%	9.4%	8.8%	10.7%	14.8%	12.3%	9.4%	12.1%
Positive comment on stipend / paid expenses	1.6%	2.4%	1.1%	1.7%	1.1%	1.7%	1.6%	2.2%
Positive comment on quality of program instructors	19.4%	18.8%	19.2%	18.2%	14.8%	22.5%	19.9%	19.9%
Benefits of interacting with other participants	8.4%	12.9%	11.5%	5.0%	7.7%	6.8%	7.8%	9.5%
Minority or female participant felt discrimination	.2%	1.2%		.8%				.4%
General negative comment	3.6%	1.2%	3.8%	5.0%	3.3%	4.2%	3.2%	3.9%
Negative comment on stipend or expenses	.3%		.5%	1.7%		.4%		.4%
Negative comment on instructional quality	2.5%	1.2%	3.3%	2.5%	1.1%	3.4%	2.5%	2.6%
None	4.5%	5.9%	4.4%	5.0%	3.8%	3.0%	5.0%	4.8%
Other	1.1%	1.2%	.5%		1.1%	2.1%	.9%	1.3%
Suggestions for NSF								
Better outreach / recruiting	12.5%	18.2%	12.3%	11.3%	12.8%	13.5%	12.7%	9.1%
Keep funding or increase program	47.7%	49.4%	46.1%	57.7%	49.4%	48.5%	44.1%	48.1%
More followup / regular participation	8.7%	9.1%	11.7%	5.2%	10.3%	9.0%	7.2%	9.1%
More projects for elementary (pre high school) teachers	5.0%	2.6%	6.5%	5.2%	7.7%	4.5%	4.7%	3.7%
Involve teachers more in planning, running projects	4.2%	6.5%	2.6%	7.2%	5.8%	3.0%	4.7%	2.1%
Support for school districts to acquire teaching materials	2.5%	2.6%	.6%	3.1%	2.6%	3.0%	2.5%	3.2%
Family allowances or family presence at program	.9%	1.3%	.6%	1.0%	.6%	1.0%	.8%	1.1%
Have TEP part of a degree program	1.5%		2.6%		1.3%	2.0%	1.4%	2.1%
Fund local projects	2.2%	2.6%			2.6%	2.5%	2.8%	3.2%
Target special student populations	1.4%		1.3%	2.1%	3.2%	1.0%	.6%	2.1%
Emphasize hands on activities	1.5%	1.3%	1.9%	1.0%	1.9%	1.0%	1.7%	1.6%
Other suggestions for course content	12.2%	9.1%	14.3%	9.3%	11.5%	14.0%	11.6%	13.4%
Enroll teachers on a geographic basis	3.5%	3.9%	1.9%	3.1%	6.4%	3.5%	3.0%	3.2%
Increase stipend or expenses	3.3%	3.9%	4.5%	2.1%	2.6%	3.5%	3.6%	2.7%
More careful participant selection or recruitment	1.5%	1.3%	1.3%		1.3%	1.5%	1.7%	2.1%
More participation by minority teachers	.5%		1.9%			.5%	.6%	
None	11.6%	11.7%	11.0%	11.3%	7.7%	8.5%	13.2%	15.5%
Other	4.8%	3.9%	5.2%	6.2%	2.6%	6.0%	5.8%	2.7%

Note: Responses are summarized from respondents' own words. Multiple responses were accepted.

APPENDIX D

TEP PRINCIPAL INVESTIGATOR TABLES

1. What were the major goals for participants in your project?	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
All awards	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
To improve teacher-specific knowledge of science or mathematics content.							
Not a goal	1.1%	4.8%		1.3%			1.1%
...	2.2%	4.8%	2.5%	2.6%	1.6%		2.2%
Moderate goal	9.6%	3.2%	12.5%	7.8%	12.7%	14.1%	6.7%
...	17.1%	21.0%	11.3%	23.4%	15.2%	13.4%	19.1%
Major goal	70.0%	66.1%	73.8%	64.9%	70.5%	72.5%	70.9%
To increase teachers' knowledge of the applications of science or mathematics principles.							
Not a goal	1.8%	4.8%		1.3%		3.9%	1.1%
...	5.6%	6.5%	6.3%	6.5%	4.4%	5.0%	5.1%
Moderate goal	17.5%	17.7%	17.5%	18.2%	22.1%	13.2%	17.2%
...	28.4%	25.8%	30.0%	31.2%	27.0%	20.2%	35.0%
Major goal	46.7%	45.2%	46.3%	42.9%	46.5%	57.7%	41.6%
To develop ways for teachers to enhance student interest in science or mathematics.							
Not a goal	.9%	1.6%	1.3%				2.4%
...	1.8%	4.8%	2.5%	1.3%		2.2%	
Moderate goal	10.5%	9.7%	18.8%	10.4%	4.5%	9.2%	8.7%
...	25.7%	40.3%	21.3%	20.8%	20.0%	25.1%	28.2%
Major goal	61.2%	43.5%	56.3%	67.5%	75.5%	63.6%	60.8%
Develop skills for improving students' problem-solving or critical thinking abilities.							
Not a goal	3.4%	6.5%	7.5%	1.3%		3.7%	1.1%
...	5.7%	6.5%	6.3%	1.3%	3.7%	9.9%	6.3%
Moderate goal	21.4%	22.6%	32.5%	24.7%	9.7%	13.9%	22.3%
...	25.0%	37.1%	15.0%	24.7%	28.5%	29.1%	19.5%
Major goal	44.5%	27.4%	38.8%	48.1%	58.1%	43.4%	50.8%
To construct, investigate, document or refine effective teaching materials.							
Not a goal	6.1%	9.7%	7.5%	3.9%	5.1%	6.4%	4.5%
...	9.8%	6.5%	13.8%	11.7%	10.1%	8.6%	7.8%
Moderate goal	20.0%	19.4%	16.3%	19.5%	19.3%	13.5%	31.5%
...	24.7%	25.8%	26.3%	22.1%	29.2%	20.6%	25.3%
Major goal	39.3%	38.7%	36.3%	42.9%	36.3%	50.9%	30.9%
To give participants experience with hands-on activities.							
Not a goal	1.3%	1.6%	2.5%		1.5%		2.4%
...	3.3%	4.8%	2.5%	3.9%	2.8%	2.8%	3.2%

(continued)

Responses are weighted to represent all awardees

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1. What were the major goals for participants in your project?	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Moderate goal	6.7%	9.7%	7.5%	6.5%	1.3%	6.8%	7.3%
...	16.4%	22.6%	12.5%	13.0%	16.8%	16.8%	18.0%
Major goal	72.3%	61.3%	75.0%	76.6%	77.5%	73.6%	68.9%
To develop ways for teachers to integrate science and mathematics instruction.							
Not a goal	22.0%	24.2%	26.6%	18.4%	14.9%	25.8%	20.7%
...	25.0%	17.7%	25.3%	34.2%	29.1%	18.5%	25.3%
Moderate goal	24.9%	16.1%	29.1%	22.4%	27.7%	22.4%	29.9%
...	14.1%	21.0%	6.3%	10.5%	16.8%	19.0%	13.1%
Major goal	14.0%	21.0%	12.7%	14.5%	11.5%	14.3%	11.0%
To help teachers learn how to update their teaching practices continuously to take into account new methods and course c							
Not a goal	8.5%	14.5%	8.8%	5.2%	6.4%	6.8%	9.6%
...	8.9%	3.2%	10.0%	7.8%	10.2%	12.3%	9.0%
Moderate goal	21.9%	32.3%	25.0%	15.6%	16.3%	17.3%	25.2%
...	27.7%	24.2%	21.3%	28.6%	32.4%	28.2%	32.4%
Major goal	33.0%	25.8%	35.0%	42.9%	34.7%	35.4%	23.7%
To enhance each participant's sense of self-competence as a teacher.							
Not a goal	3.1%	6.5%	2.5%	1.3%	1.7%	4.8%	2.1%
...	2.2%	1.6%	5.1%	1.3%		2.2%	2.3%
Moderate goal	18.8%	24.2%	17.7%	19.7%	19.2%	18.0%	15.0%
...	21.0%	19.4%	16.5%	17.1%	24.3%	19.5%	29.2%
Major goal	55.0%	48.4%	58.2%	60.5%	54.8%	55.5%	51.3%
To develop participants' abilities to lead local in-service teacher training programs.							
Not a goal	14.9%	25.8%	18.8%	11.8%	7.5%	14.1%	11.8%
...	7.7%	8.1%	11.3%	6.6%	8.6%	7.4%	4.5%
Moderate goal	21.4%	21.0%	23.8%	22.4%	12.7%	21.5%	25.2%
...	23.7%	21.0%	25.0%	21.1%	26.2%	17.4%	30.9%
Major goal	32.3%	24.2%	21.3%	38.2%	45.0%	39.6%	27.6%
To develop participants' abilities to work with other sources of scientific and mathematics expertise.							
Not a goal	22.3%	32.3%	22.5%	18.4%	21.2%	22.9%	18.0%
...	16.3%	17.7%	15.0%	10.5%	23.7%	13.7%	18.4%
Moderate goal	26.4%	12.9%	31.3%	31.6%	22.4%	25.1%	31.5%
...	20.4%	22.6%	18.8%	18.4%	26.2%	22.1%	15.9%
Major goal	14.7%	14.5%	12.5%	21.1%	6.5%	16.2%	16.2%

(continued)

Responses are weighted to represent all awardees

1. What were the major goals for participants in your project?	All awards	1984
Other		
Moderate goal	1.8%	16.7%
...	18.3%	
Major goal	80.0%	83.3%
Other goals:		
	100.0%	100.0%
Teaching handicapped pupils	.9%	1.6%
Formation of participant network	2.8%	
Teach skills	4.4%	4.8%
Teaching minorities	.6%	1.6%
Revitalization or renewed interest in teaching	1.7%	1.6%
Increased professional development	1.3%	

Responses are weighted to represent all awardees

Fiscal year of award					
84	1985	1986	1987	1988	1989
6.7%	22.2%	16.7%	12.4%	21.2%	26.1%
3.3%	77.8%	83.3%	87.6%	78.8%	73.9%
0.0%	100.0%	100.0%	100.0%	100.0%	100.0%
1.6%	1.3%		2.8%		
	1.3%	2.6%	3.1%	3.5%	6.0%
4.8%	6.3%	5.2%	1.4%	6.0%	2.3%
1.6%		1.3%			1.1%
1.6%	2.5%	2.6%	1.3%		2.3%
	1.3%	3.9%		1.2%	1.0%

1. What were the three goals most strongly emphasized by your project?	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
All awards	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Most strongly emphasized goal							
Improve teacher-specific knowledge of science or mathematics	52.8%	49.2%	55.3%	52.6%	56.2%	56.2%	47.3%
Increase teachers' knowledge of science or math principle ap	6.3%	8.5%	5.3%	3.9%	1.8%	8.7%	8.8%
Develop ways for teachers to enhance student interest in sci	5.8%	1.7%	3.9%	9.2%	7.3%	7.7%	4.7%
Develop skills for improving students' problem-solving abili	7.1%	5.1%	5.3%	9.2%	8.5%	8.0%	6.6%
Construct, investigate, document or refine teaching material	2.8%	3.4%	3.9%	2.6%	5.3%		2.1%
Give participants experience with hands-on activities.	6.6%	10.2%	6.6%	3.9%	5.5%	4.7%	8.8%
Develop ways for teachers to integrate science & mathinstruc	.2%	1.7%					
Help teachers learn to update their teaching practices	.9%		1.3%		1.5%	1.5%	1.3%
Enhance participant sense of self-competence as teacher	5.1%	6.8%	7.9%	3.9%	3.2%	5.2%	3.4%
Develop participant ability to lead in-service training prog	4.4%	8.5%	1.3%	2.6%	4.1%	2.2%	8.2%
Help participants work with other sources of science & math	1.1%		1.3%	1.3%			3.2%
Other	7.0%	5.1%	7.9%	10.5%	6.9%	5.9%	5.6%
Second most strongly emphasized goal							
Improve teacher-specific knowledge of science or mathematics	5.6%	5.1%	7.9%	3.9%	4.7%	3.6%	7.9%
Increase teachers' knowledge of science or math principles	16.3%	18.6%	15.8%	11.8%	19.8%	18.1%	15.2%
Develop ways for teachers to enhance student interest in sci	20.5%	15.3%	25.0%	25.0%	14.4%	22.1%	18.8%
Develop skills for improving students' problem-solving abili	8.4%	10.2%	5.3%	7.9%	12.9%	7.9%	8.1%
Construct, investigate, document or refine teaching material	8.0%	11.9%	5.3%	9.2%	4.0%	13.4%	4.6%
Give participants experience with hands-on activities.	21.6%	18.6%	21.1%	23.7%	23.3%	18.5%	24.2%
Develop ways for teachers to integrate science & mathinstruc	1.3%			1.3%	1.6%	2.6%	2.3%
Help teachers learn to update their teaching practices	6.1%	5.1%	7.9%	7.9%	5.0%	7.4%	3.1%
Enhance participant sense of self-competence as teacher	5.8%	10.2%	3.9%	3.9%	9.0%		9.0%
Develop participant ability to lead in-service training prog	3.4%	3.4%	5.3%	1.3%	3.8%	4.1%	2.3%

(continued)

Responses are weighted to represent all awardees

1. What were the three goals most strongly emphasized by your project?	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Help participants work with other sources of science & math	1.6%	1.7%	2.6%	1.3%		1.2%	2.3%
Other	1.3%			2.6%	1.6%	1.1%	2.2%
Third most strongly emphasized goal							
Improve teacher-specific knowledge of science or mathematics	3.6%	8.5%		1.3%	3.1%	3.7%	6.1%
Increase teachers' knowledge of science or math principle ap	3.3%	5.1%	5.3%	2.6%	1.7%	2.6%	2.3%
Develop ways for teachers to enhance student interest in sci	8.6%	11.9%	6.6%	6.6%	9.1%	6.3%	12.0%
Develop skills for improving students' problem-solving abili	5.9%	6.8%	3.9%	9.2%	3.9%	3.1%	8.1%
Construct, investigate, document or refine teaching material	6.7%	1.7%	3.9%	7.9%	10.1%	7.4%	9.1%
Give participants experience with hands-on activities.	23.7%	23.7%	28.9%	21.1%	24.7%	31.3%	13.2%
Develop ways for teachers to integrate science & mathinstruc	2.1%	3.4%	2.6%	1.3%	3.2%	2.6%	
Help teachers learn to update their teaching practices	5.7%	6.8%	5.3%	7.9%	4.8%	6.4%	3.4%
Enhance participant sense of self-competence as teacher	17.1%	15.3%	19.7%	14.5%	11.7%	15.7%	23.3%
Develop participant ability to lead in-service training prog	10.6%	3.4%	11.8%	9.2%	15.4%	11.1%	12.4%
Help participants work with other sources of science & math	4.1%	3.4%	2.6%	7.9%	2.0%	6.1%	2.2%
Other	8.5%	10.2%	9.2%	10.5%	10.2%	3.7%	7.7%
Ranked first, second, or third							
Improve teacher-specific knowledge of science or mathematics	62.0%	62.7%	63.2%	57.9%	64.1%	63.4%	61.3%
Increase teachers' knowledge of science or math principle ap	25.9%	32.2%	26.3%	18.4%	23.3%	29.1%	26.3%
Develop ways for teachers to enhance student interest in sci	34.9%	28.8%	35.5%	40.8%	30.7%	35.7%	35.5%
Develop skills for improving students' problem-solving abili	21.4%	22.0%	14.5%	26.3%	25.2%	18.8%	22.8%
Construct, investigate, document or refine teaching material	17.5%	16.9%	13.2%	19.7%	19.3%	20.5%	15.8%
Give participants experience with hands-on activities.	51.7%	52.5%	56.6%	48.7%	53.5%	53.5%	46.2%
Develop ways for teachers to integrate science & mathinstruc	3.6%	5.1%	2.6%	2.6%	4.7%	5.1%	2.3%
Help teachers learn to update their teaching practices	12.8%	11.9%	14.5%	15.8%	11.3%	15.0%	7.9%
Enhance participant sense of self-competence as teacher	27.8%	32.2%	31.6%	22.4%	23.9%	20.5%	35.7%

(continued)

Responses are weighted to represent all awardees

1. What were the three goals most strongly emphasized by your project?	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Develop participant ability to lead in-service training prog	18.3%	15.3%	18.4%	13.2%	23.3%	17.1%	23.0%
Help participants work with other sources of science & math	6.7%	5.1%	6.6%	10.5%	2.0%	7.2%	7.7%
Other	16.7%	15.3%	17.1%	23.7%	18.6%	10.6%	15.5%

Responses are weighted to represent all awardees

2. To what extent were the following considerations important to the project's organizational objectives?	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
All awards	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
To address specific local or regional problems or needs for science and mathematics education.							
Not a goal	11.7%	17.7%	13.9%	6.5%	11.6%	7.8%	13.2%
...	8.8%	14.5%	7.6%	9.1%	9.1%	7.1%	6.7%
Moderate goal	15.4%	19.4%	26.6%	7.8%	13.7%	13.4%	11.2%
...	17.5%	17.7%	8.9%	19.5%	25.6%	16.3%	19.3%
Major goal	46.6%	30.6%	43.0%	57.1%	40.0%	55.5%	49.6%
To increase collaboration among scientists or mathematicians and education specialists at host institution.							
Not a goal	25.2%	25.8%	30.0%	20.8%	21.7%	27.1%	24.5%
...	19.5%	21.0%	20.0%	20.8%	17.1%	20.0%	17.8%
Moderate goal	21.8%	11.3%	18.8%	26.0%	22.3%	27.8%	23.0%
...	18.0%	16.1%	20.0%	20.8%	25.2%	9.1%	17.8%
Major goal	15.6%	25.8%	11.3%	11.7%	13.6%	15.9%	16.9%
To establish continuing partnerships among faculties of schools, colleges, and universities, and science and mathematics							
Not a goal	22.0%	24.2%	23.8%	17.1%	18.2%	26.9%	21.0%
...	13.1%	21.0%	12.5%	11.8%	9.1%	10.4%	14.5%
Moderate goal	20.0%	17.7%	25.0%	26.3%	17.1%	16.5%	16.3%
...	20.6%	21.0%	17.5%	15.8%	32.1%	21.2%	18.6%
Major goal	24.3%	16.1%	21.3%	28.9%	23.5%	25.0%	29.6%
To utilize local in-kind or financial support.							
Not a goal	24.0%	45.2%	25.3%	24.7%	15.8%	20.7%	15.2%
...	17.8%	16.1%	22.8%	23.4%	13.9%	16.5%	13.2%
Moderate goal	30.6%	22.6%	34.2%	29.9%	29.0%	32.7%	33.1%
...	15.0%	9.7%	10.1%	11.7%	19.1%	19.4%	19.9%
Major goal	12.5%	6.5%	7.6%	10.4%	22.1%	10.7%	18.6%
To secure continuing support by project staff of teachers after their return to the classroom.							
Not a goal	9.7%	14.5%	11.5%	7.9%	1.5%	13.3%	8.4%
...	11.2%	24.2%	16.7%	13.2%	4.5%	7.3%	3.1%
Moderate goal	21.9%	22.6%	21.8%	18.4%	19.7%	26.3%	22.0%
...	31.1%	30.6%	30.8%	32.9%	38.9%	23.3%	31.5%
Major goal	26.1%	8.1%	19.2%	27.6%	35.4%	29.7%	35.1%

(continued)

Responses are weighted to represent all awardees

2. To what extent were the following considerations important to the project's organizational objectives?	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
To perform an evaluation of the project's effects upon participants -- their substantive knowledge, teaching behaviors,							
Not a goal	8.0%	16.1%	12.5%	3.9%	1.8%	8.8%	4.9%
...	11.9%	12.9%	16.3%	10.4%	9.4%	11.6%	10.4%
Moderate goal	22.6%	30.6%	23.8%	18.2%	22.4%	18.9%	22.8%
...	30.0%	27.4%	26.3%	36.4%	35.7%	28.8%	26.7%
Major goal	27.5%	12.9%	21.3%	31.2%	30.6%	31.9%	35.2%

Responses are weighted to represent all awardees

3. To what extent did your project focus recruiting toward each of the following participant groups?	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
All awards	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Pre-service teachers							
Not a focus	89.8%	93.1%	84.4%	91.9%	81.4%	96.3%	91.1%
...	5.4%		9.1%	4.1%	11.6%	2.6%	4.9%
Moderate focus	3.9%	6.9%	3.9%	4.1%	5.5%		4.0%
...	.5%		1.3%		1.6%		
Major focus	.4%		1.3%			1.1%	
Well-prepared in-service teachers							
Not a focus	14.6%	6.7%	21.5%	21.1%	8.5%	15.0%	12.2%
...	6.7%	5.0%	7.6%	10.5%	5.0%	5.7%	5.7%
Moderate focus	18.4%	13.3%	21.5%	10.5%	25.6%	19.2%	19.8%
...	18.6%	11.7%	11.4%	14.5%	25.2%	20.0%	28.8%
Major focus	41.7%	63.3%	38.0%	43.4%	35.7%	40.1%	33.5%
Under-prepared in-service teachers							
Not a focus	17.7%	28.8%	19.5%	20.0%	8.1%	16.7%	13.3%
...	7.0%	6.8%	6.5%	10.7%	4.9%	4.8%	7.7%
Moderate focus	16.6%	23.7%	14.3%	8.0%	20.4%	21.4%	13.8%
...	15.0%	18.6%	7.8%	10.7%	24.4%	12.6%	18.8%
Major focus	43.8%	22.0%	51.9%	50.7%	42.1%	44.4%	46.4%
Teachers who are expected to assume leadership positions in their schools or districts							
Not a focus	10.9%	11.5%	18.2%	9.2%	7.2%	13.1%	5.4%
...	5.2%	8.2%	7.8%	5.3%	3.1%	1.4%	5.4%
Moderate focus	11.8%	13.1%	10.4%	18.4%	12.0%	9.3%	8.5%
...	22.4%	19.7%	22.1%	15.8%	32.5%	21.3%	23.9%
Major focus	49.8%	47.5%	41.6%	51.3%	45.2%	54.8%	56.8%
Teachers who are expected to assume leadership positions at the state or national level.							
Not a focus	34.8%	41.0%	37.2%	37.3%	24.6%	31.4%	36.7%
...	17.3%	11.5%	20.5%	17.3%	22.4%	15.4%	16.5%
Moderate focus	19.5%	14.8%	21.8%	18.7%	18.4%	22.2%	20.3%
...	13.9%	14.8%	12.8%	16.0%	15.6%	12.4%	12.7%
Major focus	14.3%	18.0%	7.7%	10.7%	19.1%	18.7%	13.9%
Women							
Not a focus	21.3%	26.2%	26.9%	22.4%	14.7%	18.8%	18.1%
...	3.2%	1.6%	9.0%	1.3%	1.5%	1.2%	3.3%
Moderate focus	28.1%	41.0%	24.4%	27.6%	20.2%	25.2%	31.2%
...	22.6%	16.4%	20.5%	19.7%	35.6%	16.4%	28.2%
Major focus	24.8%	14.8%	19.2%	28.9%	28.0%	38.4%	19.1%
Minorities							

(continued)

Responses are weighted to represent all awardees

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3. To what extent did your project focus recruiting toward each of the following participant groups?	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Not a focus	15.5%	29.5%	24.4%	14.7%	6.0%	10.2%	8.7%
...	5.2%	1.6%	6.4%	6.7%	8.1%	3.9%	4.2%
Moderate focus	26.9%	36.1%	26.9%	28.0%	27.5%	20.5%	24.3%
...	20.3%	14.8%	19.2%	18.7%	26.9%	14.9%	27.0%
Major focus	32.2%	18.0%	23.1%	32.0%	31.5%	50.5%	35.8%
Physically disabled							
Not a focus	49.5%	47.5%	53.2%	48.6%	48.7%	43.6%	54.1%
...	14.1%	8.2%	14.3%	10.8%	13.8%	13.8%	22.0%
Moderate focus	22.0%	34.4%	16.9%	28.4%	11.4%	24.7%	17.0%
...	9.2%	4.9%	10.4%	6.8%	19.2%	10.6%	4.7%
Major focus	5.2%	4.9%	5.2%	5.4%	7.0%	7.3%	2.2%
Teachers from economically disadvantaged areas							
Not a focus	20.3%	38.3%	26.6%	25.0%	8.6%	12.4%	11.8%
...	5.8%	8.3%	6.3%	6.6%	6.6%	5.3%	2.3%
Moderate focus	21.0%	28.3%	20.3%	21.1%	16.0%	16.5%	24.0%
...	23.7%	10.0%	25.3%	23.7%	25.1%	25.1%	30.1%
Major focus	29.2%	15.0%	21.5%	23.7%	43.7%	40.6%	31.8%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Teachers from rural or small schools	3.8%	3.2%	3.8%	3.9%	4.2%	2.4%	5.4%
Teachers from urban schools	1.0%			1.3%	1.4%	1.2%	2.1%
Private or parochial school teachers	1.0%			1.3%	3.6%	1.3%	
Males	.9%			2.6%	1.8%		1.2%
Other groups:							
Teachers from rural or small schools							
Not a focus	3.6%			16.7%			
Moderate focus	10.9%	50.0%	33.3%				14.8%
...	9.8%	50.0%			14.2%		12.7%
Major focus	35.1%		66.7%	33.3%	29.3%	48.8%	29.1%
Teachers from urban schools							
Major focus	9.9%					25.0%	27.8%
Private or parochial school teachers							
Moderate focus	7.1%				14.5%	26.2%	
...	3.6%			16.7%			
Major focus	5.1%				22.7%		
Males							
Moderate focus	3.6%			16.7%			
...	7.9%			16.7%	19.2%		

(continued)

Responses are weighted to represent all awardees

3. To what extent did your project focus recruiting toward each of the following participant groups?	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Major focus	3.5%						15.6%

Responses are weighted to represent all awardees

	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
All awards	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
What procedures did you use to recruit teachers for this workshop?							
Sent announcements to local school districts.	85.1%	90.2%	87.5%	88.3%	81.2%	83.8%	80.0%
Sent announcements to local teacher organizations.	59.6%	59.0%	62.5%	58.4%	62.7%	59.8%	55.5%
Sent announcements to special interest organizations.	48.9%	36.1%	50.0%	49.4%	46.6%	54.6%	53.3%
Sent announcements to professional journals, newsletters.	47.4%	44.3%	45.0%	42.9%	49.7%	45.2%	56.6%
Sent announcements to local newspapers, radio stations.	29.6%	42.6%	35.0%	31.2%	26.8%	26.6%	17.4%
Asked school districts to select participants.	41.7%	36.1%	35.0%	46.8%	48.4%	40.8%	44.0%
Visited schools to identify teacher candidates.	26.2%	23.0%	12.5%	28.6%	32.3%	28.1%	34.4%
Made personal contacts at conferences, meetings.	71.3%	62.3%	63.8%	72.7%	73.8%	74.7%	79.7%
Other	30.0%	26.2%	27.5%	23.4%	30.3%	37.5%	34.3%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Contacted individual teachers	11.6%	11.3%	10.0%	10.4%	17.3%	10.7%	11.1%
Contacted state education agency	5.2%	6.5%	3.8%	2.6%	5.2%	10.8%	2.4%
Contacted education schools or departments	7.7%	8.1%	8.8%	7.8%	7.0%	5.6%	8.6%
Involved former participants	5.9%	1.6%	5.0%	5.2%	1.8%	10.3%	10.0%
Contacted national professional organizations	3.8%	1.6%	2.5%	1.3%	1.5%	7.2%	7.9%

Responses are weighted to represent all awardees

4B. Did you use any special procedures to recruit:	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
All awards	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Female teachers?							
Yes	13.1%	6.7%	7.7%	14.9%	15.5%	20.2%	13.0%
No	86.9%	93.3%	92.3%	85.1%	84.5%	79.8%	87.0%
Contacted individual teachers	32.6%	50.0%	20.0%	10.0%	31.3%	35.4%	50.1%
Contacted areas that had high proportion of target group	37.1%	25.0%	60.0%	70.0%	21.2%	30.4%	24.8%
Project literature emphasized target group	16.7%			20.0%	37.5%	11.0%	17.3%
Contacted special interest groups	11.8%			10.0%	10.3%	28.7%	
Special procedures were not necessary	6.9%	25.0%	20.0%		9.2%		7.7%
Minority teachers?							
Yes	38.8%	28.3%	27.8%	33.3%	34.0%	57.5%	48.4%
No	61.2%	71.7%	72.2%	66.7%	66.0%	42.5%	51.6%
Contacted individual teachers	25.8%	43.8%	10.0%	16.7%	29.3%	27.9%	28.1%
Contacted areas that had high proportion of target group	50.6%	25.0%	70.0%	58.3%	49.1%	45.4%	52.8%
Contacted colleges and universities	1.8%				4.9%	2.0%	2.9%
Project literature emphasized target group	9.0%	12.5%	5.0%	12.5%	14.4%	10.6%	2.8%
Contacted officials representing target group	7.0%	6.3%	5.0%	12.5%	7.2%	7.2%	4.6%
Contacted special interest groups	10.1%	6.3%	10.0%	4.2%		16.1%	13.5%
Special procedures were not necessary	1.1%	6.3%					2.2%
Teachers with physically disabilities?							
Yes	3.6%		2.6%	5.5%	4.7%	5.9%	2.5%
No	96.4%	100.0%	97.4%	94.5%	95.3%	94.1%	97.5%
Contacted individual teachers	26.8%			25.0%	34.7%	40.9%	
Contacted areas that had high proportion of target group	27.1%			50.0%		19.4%	54.5%
Project literature emphasized target group	26.2%			25.0%	65.3%	19.1%	
Contacted officials representing target group	20.0%		100.0%			20.6%	45.5%
Contacted special interest groups	12.9%			25.0%		19.4%	
Teachers from economically disadvantaged areas?							
Yes	40.3%	31.7%	30.8%	32.9%	52.2%	45.5%	48.7%
No	59.7%	68.3%	69.2%	67.1%	47.8%	54.5%	51.3%
Contacted individual teachers	16.3%	23.5%	9.1%	4.3%	22.6%	15.8%	20.0%

(continued)

Responses are weighted to represent all awardees

4B. Did you use any special procedures to recruit:	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Contacted areas that had high proportion of target group	71.5%	52.9%	77.3%	87.0%	70.3%	67.8%	71.5%
Contacted colleges and universities	1.2%		4.5%				2.6%
Project literature emphasized target group	6.0%	17.6%	4.5%	4.3%	6.4%	7.8%	
Contacted officials representing target group	2.5%	5.9%		4.3%		3.0%	3.2%
Contacted special interest groups	5.2%		9.1%	4.3%	3.6%	7.9%	4.7%
Special procedures were not necessary	1.8%					2.9%	5.4%
Did you make special efforts to recruit teachers from district(s) with high minority enrollments?							
Yes	61.4%	51.7%	43.6%	61.3%	70.1%	70.9%	70.9%
No	38.6%	48.3%	56.4%	38.7%	29.9%	29.1%	29.1%

Responses are weighted to represent all awardees

6-7. Recruitment	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
At the time you received official notification of award, how many weeks did you have to recruit participants?							
Zero	5.9%	5.8%	3.0%	1.6%	5.5%	6.7%	12.1%
One to three weeks	9.5%	11.5%	13.4%	9.7%	11.7%	5.8%	6.0%
four to six	22.0%	13.5%	26.9%	25.8%	22.7%	18.9%	23.0%
seven to nine	16.3%	7.7%	17.9%	17.7%	15.9%	19.0%	17.6%
ten to twelve	17.5%	21.2%	13.4%	16.1%	15.6%	23.1%	16.1%
13 to 18	11.5%	13.5%	13.4%	9.7%	14.1%	13.1%	6.1%
19 or more	17.2%	26.9%	11.9%	19.4%	14.5%	13.3%	19.0%
Mean	12	16	10	13	12	12	11
Standard Deviation	12	16	7	13	12	11	11
Median	8	12	8	8	8	8	8
Was this time							
Adequate	37.6%	50.0%	24.7%	43.8%	42.6%	29.2%	40.1%
A little short	26.0%	22.4%	32.5%	27.4%	18.2%	33.1%	19.4%
Much too short	36.4%	27.6%	42.9%	28.8%	39.2%	37.7%	40.5%
Indicate the number of weeks that would have been adequate for recruitment							
four to six	4.0%	3.8%	1.9%		9.8%	5.8%	4.2%
seven to nine	10.7%	15.4%	18.5%	20.5%	9.4%		2.0%
ten to twelve	31.7%	30.8%	37.0%	30.8%	23.0%	32.7%	31.0%
13 to 18	29.8%	26.9%	20.4%	35.9%	38.5%	23.6%	39.6%
19 or more	23.9%	23.1%	22.2%	12.8%	19.3%	37.9%	23.2%
Mean	15	15	14	14	15	18	16
Standard Deviation	6	5	6	6	6	9	5
Median	15	13	12	12	15	16	16
How did you receive the names of applicants for your project?							
Individuals applied directly	53.0%	55.9%	52.6%	57.3%	49.0%	52.3%	51.2%
Schools, districts, or organizations submitted names	11.0%	6.8%	9.0%	12.0%	18.2%	4.5%	16.2%
Both direct applications and nominations	35.7%	35.6%	38.5%	30.7%	32.8%	43.3%	32.6%
Other	.2%	1.7%					
Please select the alternative below that best describes the balance between applicants and enrolement over the life of t							
About equal	43.5%	39.0%	46.8%	48.0%	41.5%	43.1%	41.5%
Too many Qualified applicants	52.5%	55.9%	50.6%	50.7%	51.3%	50.7%	56.3%
Too few Qualified applicants	3.9%	5.1%	2.5%	1.3%	7.3%	6.3%	2.2%

Responses are weighted to represent all awardees

6-7. Recruitment	All awards	Was this time		
		Adequate	A little short	Much too short
At the time you received official notification of award, how many weeks did you have to recruit participants?				
Zero	6.0%			16.2%
One to three weeks	9.6%		2.9%	24.0%
four to six	22.3%	10.7%	30.4%	27.7%
seven to nine	16.5%	5.0%	25.6%	21.1%
ten to twelve	17.2%	23.3%	26.0%	4.9%
13 to 18	11.4%	17.7%	12.2%	4.6%
19 or more	17.0%	43.3%	2.8%	1.5%
Mean	12	21	9	5
Median	8	16	8	4
Standard Deviation	12	15	4	6
Indicate the number of weeks that would have been adequate for recruitment				
four to six	4.0%		1.9%	5.4%
seven to nine	10.7%		9.2%	11.6%
ten to twelve	31.7%		33.1%	30.7%
13 to 18	29.8%		27.9%	31.1%
19 or more	23.9%		27.9%	21.2%
Mean	15	.	16	15
Median	15	.	15	14
Standard Deviation	6	.	6	7

Responses are weighted to represent all awardees

7. Average number of applicants positions, and enrollments	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Please select the alternative below that best describes the balance between applicants and enrolement over the life of t							
About equal							
Number Applying	.	.	.	.	.	.	.
Number Enrolled	.	.	.	.	.	.	.
Number Applying	.	.	.	.	.	.	.
Number Enrolled	.	.	.	.	.	.	.
Number of Positions Available Unweighted Valid N	.	.	.	.	.	.	.
Too many Qualified applicants							
Number Applying	148	118	172	140	144	138	163
Number Enrolled	63	36	64	79	58	60	76
Number Applying	.	.	.	.	.	.	.
Number Enrolled	.	.	.	.	.	.	.
Number of Positions Available Unweighted Valid N	.	.	.	.	.	.	.
Too few Qualified applicants							
Number Applying	.	.	.	.	.	.	.
Number Enrolled	.	.	.	.	.	.	.
Number Applying	59	19	28	180	50	84	33
Number Enrolled	37	15	23	175	38	29	26
Number of Positions Available Unweighted Valid N	47 N=16	20 N=3	30 N=1	220 N=1	51 N=4	35 N=5	27 N=2

Responses are weighted to represent all awardees

7. Recruitment	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
All awards	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Please indicate the three most important criteria by which you selected participants							
submitted applications early	6.5%	1.7%	8.8%	10.5%	9.1%	3.7%	4.6%
needed more training in subject matter	38.3%	39.0%	43.8%	38.2%	32.0%	38.3%	37.2%
already had a high level of subject matter mastery	15.0%	27.1%	20.0%	14.5%	5.1%	6.8%	16.7%
needed more training in pedagogical methods	19.5%	13.6%	23.8%	21.1%	17.9%	22.8%	16.4%
already demonstrated superior teaching/leadership abilities	34.6%	52.5%	30.0%	30.3%	32.1%	29.4%	36.9%
taught subject/s covered by the project	43.8%	50.8%	56.3%	36.8%	33.1%	40.9%	42.7%
taught an appropriate grade level	37.0%	40.7%	41.3%	28.9%	31.9%	41.5%	36.7%
came from a particular school district	15.0%	15.3%	10.0%	14.5%	14.4%	15.9%	20.2%
would be teaching female, minority, or physically disabled s	33.9%	16.9%	17.5%	36.8%	48.7%	42.6%	41.6%
Other reasons	12.4%	11.9%	15.0%	13.2%	13.3%	12.5%	8.8%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Recommendations	1.1%		2.5%	1.3%	1.6%		1.0%
Support from school district or principal	2.1%		2.5%	6.5%	1.5%	1.1%	1.0%
Applicant's desire, interest, or essay	7.6%	9.7%	8.8%	5.2%	6.9%	10.5%	4.6%
Geographic diversity	2.0%	1.6%	2.5%	1.3%	2.9%	1.4%	2.2%

Responses are weighted to represent all awardees

8. Roughly what percent of project participants came from:	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Districts in your locality	53	47	59	63	44	50	50
Other districts within your state	27	31	24	23	30	27	27
States in your region	9	11	8	6	13	8	10
Other regions of the U.S.	11	8	9	7	12	14	12

Responses are weighted to represent all awardees

9. How many teachers or other participants were new to this project each year?	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Total new participants, 1984-1990	47,001	4,789	8,936	7,192	9,018	9,629	7,418
Mean	83	57	86	76	113	98	71
Median	50	31	40	51	66	56	60
1984	2,139	1,730	344	.	.	65	.
Mean	35	36	27	.	.	50	.
Median	30	30	25	.	.	50	.
1985	7,049	2,202	4,075	579	96	97	.
Mean	44	42	46	37	38	75	.
Median	30	30	30	30	50	75	.
1986	6,572	834	2,381	2,923	311	123	.
Mean	47	43	50	44	86	52	.
Median	30	22	35	30	50	75	.
1987	7,423	23	1,364	2,225	3,465	246	100
Mean	49	17	54	39	58	39	78
Median	33	17	41	29	36	40	78
1988	8,499	.	445	1,005	2,620	3,810	619
Mean	43	.	45	30	48	45	41
Median	30	.	40	28	30	29	35
1989	9,209	.	175	427	1,597	3,277	3,733
Mean	44	.	62	30	62	45	41
Median	30	.	63	30	49	30	32
1990	6,109	.	171	32	930	2,011	2,965
Mean	43	.	61	12	78	45	37
Median	30	.	61	13	35	27	30

Note: excludes four extremely large responses
totalling more than 6000 teachers

Responses are weighted to represent all awardees

9. How many teachers or other participants were new to this project each year?	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Total new participants, 1984-1990							
Five to 34	32.0%	52.5%	45.9%	30.1%	19.5%	26.9%	18.0%
35 to 99	46.3%	37.7%	28.4%	46.6%	49.3%	50.5%	64.3%
100 or more	21.7%	9.8%	25.7%	23.3%	31.2%	22.6%	17.7%
Duration of award *							
Mean number of months	31	27	27	33	35	34	32
Median	30	24	24	33	33	33	30
Maximum	66	66	54	60	66	66	51
Number of years with reported participants							
Mean number of months	2	1	2	2	2	2	2
Median	2	1	1	2	2	2	2
Maximum	7	4	7	4	7	7	4

Note: excludes four extremely large responses totalling more than 6000 teachers

* Award length based on NSF data file

Responses are weighted to represent all awardees

10. Of your total number of participants how many were from each group?	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
White, not Hispanic	41,890	3,490	7,220	7,495	7,430	8,139	8,096
Average per award	75	45	71	81	93	82	76
Black, not Hispanic	5,703	315	864	1,396	905	1,147	1,075
Average per award	10	4	8	15	11	12	10
Hispanic	1,739	214	167	378	265	501	215
Average per award	3	3	2	4	3	5	2
Asian or Pacific Islander	993	33	277	116	115	362	90
Average per award	2	0	3	1	1	4	1
Am. Indian or Alaskan Native	335	14	94	35	36	65	91
Average per award	1	0	1	0	0	1	1
Male	18,748	1,824	3,603	2,855	3,414	3,639	3,413
Average per award	34	23	35	30	43	37	34
Female	29,896	2,117	4,589	6,629	5,376	6,004	5,181
Average per award	54	26	45	70	69	60	51
Kindergarten	1,021	90	92	116	208	397	118
Average per award	2	1	1	1	3	4	1
Elementary	14,460	452	1,802	4,656	2,672	3,170	1,709
Average per award	26	6	18	50	35	31	16
Middle/Jr. High	11,440	672	2,333	1,627	1,734	2,284	2,790
Average per award	20	9	23	17	22	22	27
Senior High	20,924	2,546	4,171	2,773	3,426	3,610	4,399
Average per award	37	33	41	29	44	35	42
Not Classroom Teachers	919	29	18	114	198	364	196
Average per award	2	0	0	1	3	4	2
Total number of physically disabled	241	26	36	84	20	18	57
Average per award	1	0	0	1	0	0	1
Total Number from economically disadvantaged areas	15,056	702	2,899	2,182	3,106	3,550	2,616
Average per award	35	13	35	30	50	42	33

Responses are weighted to represent all awardees

10. Please estimate the age distribution for the total number of participants	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
30 years or under	16	17	18	18	15	15	15
31-40 years	41	44	39	38	42	41	42
41-50 years	31	28	30	32	32	31	31
51-60 years	9	9	7	9	10	10	9
over 60 years	1	1	1	1	1	1	1
Were your enrollment goals met for							
Female teachers	81.8%	83.9%	76.3%	83.3%	79.7%	83.8%	82.5%
Minority teachers	41.1%	38.7%	34.2%	43.8%	37.1%	54.2%	35.4%
Physically disabled teachers	8.5%	9.7%	10.5%	8.3%	8.3%	9.0%	6.7%
Teachers from economically disadvantaged areas	74.4%	71.0%	68.4%	79.2%	81.0%	65.2%	80.2%

Responses are weighted to represent all awardees

12. Please estimate the percentage of participants with each category of educational background	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Kindergarten Teaching degree; little or no formal science or mathematics training.	68	44	85	65	60	82	65
Teaching degree, with some undergraduate courses in science, engineering, or mathematics.	28	35	15	35	40	17	29
Bachelors degree (or higher) in a field of science, engineering, or mathematics.	3	21	1		0	1	1
Other	1					0	6
Elementary Teaching degree; little or no formal science or mathematics training.	54	47	60	51	51	57	56
Teaching degree, with some undergraduate courses in science, engineering, or mathematics.	41	29	41	41	50	35	41
Bachelors degree (or higher) in a field of science, engineering, or mathematics.	6	28	1	5	1	8	2
Other	1	0		3		0	4
Middle Teaching degree; little or no formal science or mathematics training.	18	14	21	14	15	20	20
Teaching degree, with some undergraduate courses in science, engineering, or mathematics.	48	53	48	45	56	45	44
Bachelors degree (or higher) in a field of science, engineering, or mathematics.	35	32	33	40	30	38	34
Other	1	1	1	1	1		4
Senior High Teaching degree; little or no formal science or mathematics training.	5	5	5	4	5	3	5
Teaching degree, with some undergraduate courses in science, engineering, or mathematics.	36	36	36	32	35	40	34

Responses are weighted to represent all awardees

(continued)

12. Please estimate the percentage of participants with each category of educational background	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Bachelors degree (or higher) in a field of science, engineering, or mathematics.	60	60	60	64	59	57	59
Other	1		1	1	2	1	1

Responses are weighted to represent all awardees

13. Please indicate the percent having a sound grasp of subject matter when entering project	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Kindergarten: Science							
Mean	20	32	16	8	24	23	23
Median	10	15	10		20	10	10
Unweighted Valid N	N=53	N=4	N=8	N=9	N=7	N=12	N=13
Math							
Mean	32	19	17	41	20	41	34
Median	20	13	5	35	20	40	10
Unweighted Valid N	N=43	N=4	N=5	N=8	N=5	N=10	N=11
Elementary Science							
Mean	30	47	32	27	28	30	25
Median	20	40	25	15	20	20	10
Unweighted Valid N	N=158	N=12	N=29	N=28	N=28	N=32	N=29
Math							
Mean	34	44	34	34	26	39	30
Median	30	30	20	30	30	30	25
Unweighted Valid N	N=108	N=7	N=17	N=17	N=19	N=27	N=21
Middle school Science							
Mean	51	57	51	55	54	47	46
Median	50	50	50	60	50	50	45
Unweighted Valid N	N=240	N=27	N=49	N=38	N=31	N=42	N=53
Math							
Mean	49	48	50	57	46	51	43
Median	50	40	47	64	50	55	50
Unweighted Valid N	N=178	N=17	N=30	N=28	N=25	N=37	N=41
High school Science							
Mean	67	76	66	69	71	63	59
Median	75	80	75	80	80	70	60
Unweighted Valid N	N=247	N=39	N=52	N=34	N=35	N=42	N=45
Math							
Mean	69	66	73	74	73	68	55
Median	75	72	78	80	80	80	60
Unweighted Valid N	N=181	N=21	N=34	N=30	N=28	N=38	N=30

Responses are weighted to represent all awardees

14. For a typical participant please indicate the time allotted to each of the following:	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Summer Program							
Yes	91.5%	93.2%	90.9%	89.2%	90.8%	93.5%	91.2%
No	8.5%	6.8%	9.1%	10.8%	9.2%	6.5%	8.8%
Number of weeks							
Mean	4.1	4.1	4.4	4.3	3.7	4.0	4.0
Median	4	4	4	4	4	4	4
Initial summer, total number of contact hours							
Mean	130.6	131.8	125.8	137.4	123.1	126.7	138.1
Median	120	120	120	120	120	120	120
During School Year							
Yes	84.7%	78.2%	76.3%	90.4%	85.6%	90.5%	86.0%
No	15.3%	21.8%	23.7%	9.6%	14.4%	9.5%	14.0%
Number of project sessions or meetings for a typical participant							
Mean	8.6	5.6	6.4	11.1	8.1	7.9	11.2
Median	4	3	3	6	5	6	4
Total number of contact hours during school year							
Mean	51.1	102.4	28.9	37.6	84.7	39.3	34.2
Median	24	24	24	28	24	25	24
Subsequent summer program(s) for the same participant							
Yes	37.5%	17.8%	24.2%	39.7%	39.8%	46.2%	50.8%
No	62.5%	82.2%	75.8%	60.3%	60.2%	53.8%	49.2%
Number of weeks							
Mean	3.7	5.0	5.4	3.3	2.6	4.0	3.5
Median	4	5	6	3	2	4	3
Total number of contact hours							
Mean	119.0	319.9	146.6	102.6	76.7	116.7	95.6
Median	90	90	120	78	50	104	90
Post-summer independent study by participants							
Yes	28.6%	20.9%	19.4%	34.0%	40.3%	33.3%	25.7%
No	71.4%	79.1%	80.6%	66.0%	59.7%	66.7%	74.3%
Number of hours planned for independent study							
Mean	36.5	30.8	27.1	49.1	32.2	31.1	48.3
Median	25	25	20	32	30	20	30

(continued)

Responses are weighted to represent all awardees

14. For a typical participant please indicate the time allotted to each of the following:	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Did participants receive formal college credits toward an advanced degree?							
Yes	78.7%	78.3%	82.3%	85.7%	76.9%	74.6%	74.4%
No	21.3%	21.7%	17.7%	14.3%	23.1%	25.4%	25.6%

Responses are weighted to represent all awardees

15. Which content areas recieved emphasis in your project?	All awards	Fiscal year of award 1984	1985	1986	1987	1988	1989
All awards	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Elementary school level							
Arithmetic, computations	25.6%	26.7%	13.3%	25.0%	30.1%	36.5%	19.9%
Arithmetic, problem-solving	28.0%	26.7%	23.3%	16.7%	36.8%	34.5%	28.4%
Geometry	19.4%	33.3%	16.7%	5.6%	19.3%	23.7%	25.8%
Algebra	9.7%	6.7%	20.0%	2.8%	7.8%	11.3%	8.8%
Advanced mathematics (e.g., calculus)	.8%					3.8%	
Probability/statistics/data analysis	14.9%	13.3%	3.3%	13.9%	15.2%	24.2%	17.0%
Astronomy	24.9%	20.0%	30.0%	25.0%	20.3%	28.6%	23.0%
Atmospheric Sciences	18.5%	13.3%	23.3%	19.4%	11.3%	21.1%	20.1%
Biological Sciences	46.6%	26.7%	60.0%	50.0%	39.9%	37.8%	57.2%
Behavioral Sciences	5.2%			8.3%	2.7%	15.6%	
Chemistry	36.2%	26.7%	46.7%	30.6%	38.3%	31.0%	40.7%
Computer Sciences	12.2%	13.3%	20.0%	8.3%	7.8%	15.8%	8.7%
Earth Sciences	48.0%	46.7%	56.7%	47.2%	37.5%	37.3%	65.8%
Engineering	5.2%	13.3%	6.7%	5.6%	3.2%	6.1%	
Information Science	5.0%		6.7%	2.8%	8.6%	6.1%	2.8%
Mathematical Sciences	9.3%	13.3%	13.3%		8.6%	14.0%	9.1%
Material Sciences	4.6%	6.7%	6.7%		6.0%	9.0%	
Oceanography	13.5%	6.7%	13.3%	13.9%	9.9%	16.8%	17.2%
Physics	43.2%	20.0%	50.0%	47.2%	40.8%	38.1%	52.3%
Social Sciences	7.6%	6.7%	6.7%	8.3%	7.6%	9.9%	5.6%
Interdisciplinary	29.1%	33.3%	26.7%	22.2%	29.7%	33.1%	31.7%
Science, Technology & Society	25.2%	26.7%	23.3%	33.3%	29.0%	12.2%	28.7%
Other	7.1%	6.7%	6.7%	5.6%	8.5%	11.0%	3.0%
All awards	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Middle or junior high level							
Arithmetic, computations	13.7%	9.7%	10.9%	15.1%	10.1%	19.8%	14.6%
Arithmetic, problem-solving	25.8%	16.1%	20.0%	22.6%	36.4%	27.8%	30.8%
Geometry	20.9%	19.4%	10.9%	17.0%	27.9%	27.5%	24.7%
Algebra	20.7%	12.9%	18.2%	20.8%	20.2%	23.8%	25.2%
Advanced mathematics (e.g., calculus)	3.5%	3.2%	3.6%	1.9%	9.3%	4.6%	
Probability/statistics/data analysis	23.7%	25.8%	12.7%	24.5%	27.2%	35.2%	20.7%
Astronomy	21.1%	22.6%	29.1%	15.1%	19.6%	14.8%	23.8%
Atmospheric Sciences	13.8%	12.9%	16.4%	7.5%	10.7%	17.6%	16.3%
Biological Sciences	44.4%	48.4%	52.7%	35.8%	32.9%	48.1%	45.8%
Behavioral Sciences	3.0%			1.9%	2.5%	12.0%	1.5%
Chemistry	32.4%	29.0%	38.2%	30.2%	29.0%	28.3%	36.2%
Computer Sciences	14.0%	12.9%	21.8%	11.3%	12.6%	8.4%	14.9%
Earth Sciences	41.5%	54.8%	43.6%	32.1%	35.8%	37.1%	47.9%
Engineering	5.7%	6.5%	9.1%	5.7%	3.0%	6.6%	3.0%
Information Science	2.9%		1.8%	1.9%	5.5%	4.5%	3.2%
Mathematical Sciences	8.9%	9.7%	14.5%	1.9%	8.1%	10.6%	8.2%
Material Sciences	4.3%	6.5%	5.5%		3.0%	8.7%	2.9%
Oceanography	10.2%	6.5%	7.3%	7.5%	11.8%	14.2%	13.2%
Physics	35.2%	29.0%	45.5%	28.3%	40.2%	23.6%	41.0%

(continued)

Responses are weighted to represent all awardees

15. Which content areas recieved emphasis in your project?	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Social Sciences	5.5%	3.2%	1.8%	5.7%	7.1%	7.3%	7.4%
Interdisciplinary	21.6%	22.6%	16.4%	17.0%	30.4%	21.2%	24.9%
Science, Technology & Society	24.9%	25.8%	23.6%	32.1%	25.2%	14.6%	28.2%
Other	5.9%		7.3%	7.5%	3.0%	8.1%	6.5%
All awards	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Senior high level							
Arithmetic, computations	9.0%	8.3%	5.3%	12.2%	4.3%	11.8%	12.5%
Arithmetic, problem-solving	13.1%	6.3%	12.3%	16.3%	16.9%	11.9%	15.9%
Geometry	17.7%	12.5%	10.5%	18.4%	22.7%	19.4%	25.2%
Algebra	16.3%	4.2%	14.0%	22.4%	19.9%	20.8%	17.8%
Advanced mathematics (e.g., calculus)	11.1%	10.4%	14.0%	8.2%	18.4%	11.8%	3.8%
Probability/statistics/data analysis	21.4%	16.7%	12.3%	24.5%	23.5%	31.3%	21.8%
Astronomy	12.4%	14.6%	15.8%	8.2%	10.7%	10.5%	13.4%
Atmospheric Sciences	7.0%	4.2%	10.5%	4.1%	2.8%	11.3%	7.5%
Biological Sciences	41.9%	56.3%	42.1%	36.7%	31.0%	40.7%	42.7%
Behavioral Sciences	3.3%	2.1%		2.0%	4.8%	11.3%	
Chemistry	35.0%	45.8%	42.1%	28.6%	37.2%	26.1%	28.8%
Computer Sciences	15.5%	16.7%	26.3%	12.2%	11.7%	9.8%	13.5%
Earth Sciences	24.1%	29.2%	26.3%	24.5%	16.1%	18.6%	28.4%
Engineering	7.7%	8.3%	14.0%	2.0%	2.8%	10.3%	5.9%
Information Science	1.1%			2.0%		4.3%	
Mathematical Sciences	8.7%	12.5%	14.0%	4.1%	4.6%	8.1%	6.5%
Material Sciences	3.1%	4.2%	5.3%			6.2%	1.8%
Oceanography	7.2%	8.3%	8.8%	4.1%	8.2%	7.8%	5.5%
Physics	37.5%	41.7%	47.4%	24.5%	43.3%	28.7%	38.6%
Social Sciences	5.8%	6.3%	3.5%	4.1%	6.5%	8.9%	5.8%
Interdisciplinary	15.8%	20.8%	10.5%	14.3%	18.5%	14.9%	17.3%
Science, Technology & Society	21.6%	25.0%	21.1%	22.4%	22.8%	15.7%	23.7%
Other	4.3%	6.3%	5.3%	4.1%	4.9%		5.8%

Responses are weighted to represent all awardees

16-17. Indicate how often each of the following instructional methods was used	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Please indicate approximately what percent of the time was employed in:	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lecture	28	31	32	29	25	28	25
Hands-on activities	58	55	59	58	64	57	58
Other	13	14	9	13	10	15	18
Lecture							
Not used	4.6%	5.1%	6.3%	5.3%	1.5%	2.2%	6.5%
Used some	57.1%	49.2%	51.9%	53.3%	68.3%	54.8%	65.7%
Used often	38.3%	45.8%	41.8%	41.3%	30.3%	43.0%	27.7%
Small group discussion							
Not used	4.4%	3.6%	7.9%	6.9%		2.4%	4.3%
Used some	50.3%	43.6%	56.6%	54.2%	47.6%	54.5%	43.0%
Used often	45.4%	52.7%	35.5%	38.9%	52.4%	43.2%	52.6%
Instructor demonstrations							
Not used	13.6%	16.0%	14.3%	15.1%	12.1%	11.2%	13.3%
Used some	56.2%	54.0%	54.5%	63.0%	47.9%	51.3%	64.2%
Used often	30.2%	30.0%	31.2%	21.9%	40.0%	37.5%	22.5%
Participant hands-on activities							
Not used	.4%		1.3%				1.1%
Used some	13.8%	16.1%	17.7%	14.5%	11.7%	12.4%	10.5%
Used often	85.7%	83.9%	81.0%	85.5%	88.3%	87.6%	88.4%
Cooperative learning groups							
Not used	14.6%	20.0%	23.0%	11.0%	13.2%	11.5%	10.0%
Used some	46.1%	42.0%	50.0%	45.2%	49.7%	48.9%	40.7%
Used often	39.3%	38.0%	27.0%	43.8%	37.1%	39.6%	49.3%
Computer assisted instruction							
Not used	57.3%	58.0%	66.7%	56.7%	54.1%	47.9%	60.2%
Used some	34.5%	34.0%	24.2%	34.3%	38.6%	45.5%	30.7%
Used often	8.2%	8.0%	9.1%	9.0%	7.3%	6.7%	9.1%
Role playing, games or simulations							
Not used	51.9%	64.6%	65.7%	50.7%	41.4%	42.6%	48.4%
Used some	41.0%	31.3%	31.3%	40.6%	49.0%	47.6%	44.5%
Used often	7.1%	4.2%	3.0%	8.7%	9.6%	9.7%	7.1%
Viewing films/videos							
Not used	36.9%	42.9%	50.0%	37.7%	34.8%	22.5%	35.0%
Used some	57.5%	51.0%	45.7%	56.5%	59.0%	67.6%	62.9%
Used often	5.6%	6.1%	4.3%	5.8%	6.1%	9.9%	2.1%

(continued)

Responses are weighted to represent all awardees

16-17. Indicate how often each of the following instructional methods was used	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Library research							
Not used	54.6%	44.9%	60.0%	44.9%	50.3%	59.1%	64.0%
Used some	39.0%	46.9%	33.8%	47.8%	40.6%	34.3%	33.6%
Used often	6.4%	8.2%	6.2%	7.2%	9.1%	6.6%	2.4%
Use of resource people							
Not used	14.0%	15.1%	21.6%	12.2%	11.2%	9.9%	13.7%
Used some	52.5%	45.3%	51.4%	55.4%	57.8%	53.6%	50.9%
Used often	33.4%	39.6%	27.0%	32.4%	30.9%	36.5%	35.4%
Field trips							
Not used	36.5%	29.6%	33.3%	41.1%	43.4%	38.4%	33.3%
Used some	41.9%	46.3%	44.0%	43.8%	35.6%	35.2%	46.3%
Used often	21.6%	24.1%	22.7%	15.1%	21.0%	26.4%	20.5%
Examining instructional resources							
Not used	18.2%	19.6%	30.6%	9.5%	20.9%	13.4%	16.0%
Used some	60.6%	66.7%	52.8%	62.2%	53.6%	69.5%	59.7%
Used often	21.2%	13.7%	16.7%	28.4%	25.5%	17.1%	24.3%
Development of student instructional materials							
Not used	17.8%	18.2%	22.4%	13.2%	23.9%	12.1%	18.2%
Used some	38.6%	40.0%	39.5%	34.2%	27.7%	39.0%	48.7%
Used often	43.6%	41.8%	38.2%	52.6%	48.5%	48.9%	33.1%
Peer teaching							
Not used	28.7%	44.0%	37.1%	22.9%	18.6%	25.6%	26.0%
Used some	44.2%	38.0%	41.4%	51.4%	42.6%	45.4%	44.9%
Used often	27.1%	18.0%	21.4%	25.7%	38.8%	29.0%	29.1%
Other							
	90.7%	95.0%	91.3%	87.0%	91.9%	89.6%	90.4%
Not used	.4%					2.4%	
Used some	2.0%		2.5%	3.9%	3.2%	1.3%	1.1%
Used often	6.8%	5.0%	6.3%	9.1%	4.9%	6.7%	8.5%

Responses are weighted to represent all awardees

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17. Please state your assessment of its effectiveness as a teaching device	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
All awards	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lecture							
Ineffective	.2%					1.1%	
...	2.6%		4.2%	1.4%	3.4%	2.1%	3.9%
Moderately effective	28.2%	33.3%	26.4%	34.8%	24.4%	23.7%	27.5%
...	39.9%	29.8%	45.8%	42.0%	39.2%	42.6%	37.6%
Very effective	29.1%	36.8%	23.6%	21.7%	33.1%	30.4%	31.0%
Small group discussion							
...	.6%			1.5%	2.5%		
Moderately effective	8.6%	5.6%	14.5%	12.3%	9.3%	8.8%	1.1%
...	39.2%	38.9%	37.7%	35.4%	36.3%	43.1%	42.4%
Very effective	51.6%	55.6%	47.8%	50.8%	51.9%	48.1%	56.4%
Instructor demonstrations							
...	.2%					1.3%	
Moderately effective	12.8%	4.7%	18.5%	15.3%	14.9%	9.8%	11.5%
...	38.1%	51.2%	29.2%	35.6%	30.3%	37.1%	47.2%
Very effective	48.9%	44.2%	52.3%	49.2%	54.8%	51.8%	41.3%
Participant hands-on activities							
Moderately effective	1.4%	5.2%	2.7%				1.2%
...	11.7%	13.8%	10.7%	16.2%	6.1%	14.4%	8.6%
Very effective	86.8%	81.0%	86.7%	83.8%	93.9%	85.6%	90.2%
Cooperative learning groups							
...	.3%				2.1%		
Moderately effective	10.2%	4.8%	17.5%	15.9%		8.8%	11.0%
...	32.8%	35.7%	26.3%	34.9%	38.6%	35.6%	28.1%
Very effective	56.7%	59.5%	56.1%	49.2%	59.3%	55.6%	60.9%
Computer assisted instruction							
...	6.3%	4.8%	9.5%	3.6%	9.0%	5.2%	6.6%
Moderately effective	40.8%	28.6%	47.6%	50.0%	26.2%	50.7%	35.5%
...	28.3%	42.9%	14.3%	21.4%	35.7%	26.1%	31.1%
Very effective	24.7%	23.8%	28.6%	25.0%	29.0%	18.1%	26.8%
Role playing, games or simulations							
Ineffective	.6%				3.2%		
...	1.3%			3.0%	4.4%		
Moderately effective	27.4%	22.2%	17.4%	30.3%	27.0%	39.3%	22.3%
...	38.6%	38.9%	43.5%	42.4%	30.1%	41.0%	37.0%
Very effective	32.1%	38.9%	39.1%	24.2%	35.2%	19.6%	40.6%
Viewing films/videos							
Ineffective	.4%			2.4%			
...	6.6%	7.1%	3.1%	7.1%	10.7%	6.4%	5.7%
Moderately effective	45.4%	50.0%	65.6%	50.0%	32.8%	35.1%	45.4%

(continued)

Responses are weighted to represent all awardees

17. Please state your assessment of its effectiveness as a teaching device	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
...	35.4%	35.7%	28.1%	31.0%	30.0%	44.8%	37.3%
Very effective	12.1%	7.1%	3.1%	9.5%	26.5%	13.7%	11.6%
Library research							
...	4.5%	7.4%	4.0%	5.6%			10.0%
Moderately effective	44.3%	37.0%	60.0%	44.4%	44.5%	43.7%	36.3%
...	34.1%	33.3%	16.0%	41.7%	23.1%	43.3%	43.5%
Very effective	17.1%	22.2%	20.0%	8.3%	32.4%	13.0%	10.2%
Use of resource people							
Ineffective	.3%			1.6%			
...	1.2%		5.2%				1.4%
Moderately effective	17.4%	13.3%	15.5%	22.6%	16.0%	21.9%	13.7%
...	31.9%	28.9%	32.8%	32.3%	33.2%	28.1%	35.6%
Very effective	49.3%	57.8%	46.6%	43.5%	50.8%	50.0%	49.3%
Field trips							
...	.4%		2.0%				
Moderately effective	12.6%	12.5%	16.3%	16.7%	5.7%	10.0%	12.1%
...	24.0%	17.5%	14.3%	26.2%	25.0%	30.8%	30.4%
Very effective	63.0%	70.0%	67.3%	57.1%	69.3%	59.2%	57.5%
Examining instructional resources							
Ineffective	.3%					1.7%	
...	1.5%		4.1%	3.2%		1.5%	
Moderately effective	28.4%	35.0%	30.6%	31.7%	33.9%	15.7%	27.5%
...	39.1%	42.5%	36.7%	39.7%	24.9%	49.7%	38.3%
Very effective	30.6%	22.5%	28.6%	25.4%	41.2%	31.4%	34.3%
Development of student instructional materials							
...	1.8%	2.2%	3.4%	3.2%	2.5%		
Moderately effective	11.7%	2.2%	17.2%	11.1%	10.0%	13.2%	13.9%
...	34.1%	30.4%	32.8%	38.1%	23.4%	34.3%	41.2%
Very effective	52.4%	65.2%	46.6%	47.6%	64.1%	52.5%	44.9%
Peer teaching							
...	1.4%		2.3%	3.8%			1.7%
Moderately effective	17.0%	13.8%	18.6%	26.9%	11.8%	17.0%	12.7%
...	33.2%	44.8%	27.9%	26.9%	35.6%	34.6%	33.4%
Very effective	48.4%	41.4%	51.2%	42.3%	52.5%	48.4%	52.2%
Other							
Moderately effective	2.7%				22.3%		
...	22.3%		28.6%	20.0%	17.3%	27.1%	32.8%
Very effective	75.0%	100.0%	71.4%	80.0%	60.4%	72.9%	67.2%

Responses are weighted to represent all awardees

18. Development of curricula materials	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
All awards	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Were instructional materials developed as part of this project?							
Yes	75.1%	80.3%	72.5%	75.3%	68.6%	79.7%	74.1%
No	24.9%	19.7%	27.5%	24.7%	31.4%	20.3%	25.9%
Please indicate level							
Kindergarten	17.2%	10.6%	13.8%	16.4%	18.2%	21.5%	21.4%
Elementary school	36.4%	19.1%	39.7%	34.5%	46.6%	47.7%	28.9%
Middle or junior high school	62.2%	51.1%	62.1%	69.1%	61.6%	61.0%	67.1%
High school	61.8%	72.3%	69.0%	56.4%	62.1%	58.1%	54.4%
Briefly describe the materials developed							
Classroom unit, teaching unit, sylabus, etc.	51.1%	51.1%	45.5%	58.6%	55.4%	44.5%	53.4%
Resource book	17.0%	13.3%	14.5%	13.8%	14.3%	19.5%	25.3%
Laboratory materials	23.5%	17.8%	30.9%	19.0%	16.2%	31.3%	.21.8%
Teaching scientific principles	5.2%	8.9%	7.3%	1.7%	8.9%	5.9%	
Teaching mathematics principles	5.3%	6.7%	1.8%	3.4%	12.6%	6.3%	3.0%
Computer software	8.0%	6.7%	16.4%	10.3%	2.2%	4.4%	6.4%
Physical sciences instrumentation or methods	27.8%	22.2%	32.7%	29.3%	34.7%	26.3%	22.4%
Life sciences instrumentation or methods	5.0%	2.2%	10.9%	5.2%	2.8%	1.5%	6.6%
Environmental sciences instrumentation or methods	4.4%	6.7%	1.8%	6.9%		6.4%	3.8%
Mathematics instrumentation or methods	12.3%	8.9%	16.4%	3.4%	12.0%	15.9%	16.2%

Responses are weighted to represent all awardees

19. To what extent were each of the following involved in developing instructional materials?	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
All awards	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
a.Teacher participants							
Not involved	1.8%	4.1%	3.4%			1.5%	1.4%
...	1.5%		3.4%	3.4%		1.8%	
Somewhat involved	8.2%	4.1%	10.3%	8.6%	14.2%	10.2%	2.9%
...	8.4%	10.2%	13.8%	5.2%	4.5%	6.2%	9.7%
Heavily involved	80.0%	81.6%	69.0%	82.8%	81.3%	80.4%	86.1%
b.Principal Investigator							
Not involved	11.0%	6.1%	21.8%	7.1%	9.7%	10.5%	9.4%
...	6.0%	4.1%	3.6%	5.4%	7.1%	8.9%	6.5%
Somewhat involved	19.2%	24.5%	16.4%	17.9%	13.2%	22.9%	18.6%
...	25.6%	28.6%	20.0%	32.1%	16.6%	26.8%	27.8%
Heavily involved	38.3%	36.7%	38.2%	37.5%	53.4%	30.9%	37.7%
c.Other project staff							
Not involved	6.5%	9.8%	16.7%	5.7%			6.2%
...	3.7%	4.9%	3.7%	3.8%	2.0%	4.7%	3.0%
Somewhat involved	15.1%	14.6%	11.1%	9.4%	23.7%	15.1%	18.3%
...	24.9%	24.4%	22.2%	28.3%	17.0%	25.1%	30.3%
Heavily involved	49.8%	46.3%	46.3%	52.8%	57.2%	55.1%	42.3%
d.Outside specialists							
Not involved	39.0%	45.9%	50.0%	40.0%	43.6%	33.7%	23.8%
...	14.9%	5.4%	14.0%	16.0%	7.1%	22.9%	18.9%
Somewhat involved	18.0%	24.3%	14.0%	22.0%	24.0%	13.8%	13.7%
...	16.6%	13.5%	12.0%	14.0%	16.4%	20.1%	22.5%
Heavily involved	11.5%	10.8%	10.0%	8.0%	8.9%	9.5%	21.0%

Responses are weighted to represent all awardees

20-21. Review and dissemination	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
All awards	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Were these materials reviewed for content accuracy by PIs or other experts in the relevant disciplines?							
All were reviewed	77.7%	75.5%	78.9%	75.9%	85.5%	77.7%	74.4%
Some were reviewed	16.7%	18.4%	12.3%	17.2%	14.5%	17.9%	19.4%
No	5.6%	6.1%	8.8%	6.9%		4.5%	6.3%
How were these materials disseminated?							
Used by participating teachers	99.1%	98.0%	96.6%	100.0%	100.0%	100.0%	100.0%
Shared with other teachers in participants' school systems	88.2%	77.6%	84.5%	91.4%	89.7%	93.6%	91.2%
Shared with other teachers not from participants' school system	62.3%	61.2%	55.2%	55.2%	76.9%	64.7%	63.7%
Presented at in-service workshops/professional conferences	79.6%	73.5%	77.6%	77.6%	90.2%	77.0%	83.4%
Shared with (other) college/university teachers	29.7%	24.5%	27.6%	34.5%	45.8%	26.6%	23.4%
Published in non-commercial publications, e.g., journals	24.4%	24.5%	22.4%	27.6%	27.5%	21.4%	24.4%
Sold by publishers or educational media producers	7.6%	14.3%	1.7%	5.2%	11.6%	7.2%	7.5%
Other	6.7%	8.2%	10.3%	8.6%	6.1%	5.9%	1.4%
Materials not disseminated							

Responses are weighted to represent all awardees

22. To what extent does each statement describe your project or its results?	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
All awards	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
a. Participants increased their knowledge of science or mathematics content.							
Not true	.2%						1.1%
...	.5%		1.3%	1.3%			
Somewhat true	4.5%	4.9%	3.8%	1.3%	4.5%	5.3%	6.9%
...	13.2%	13.1%	13.8%	13.0%	11.1%	16.1%	12.0%
Very true	81.1%	80.3%	81.3%	84.4%	82.3%	78.6%	80.0%
Don't know	.5%	1.6%			2.2%		
b. Participants increased their knowledge of the applications of science or mathematics principles							
Not true	.7%		2.5%				1.1%
...	3.2%	1.6%	1.3%	3.9%	2.8%	5.9%	3.5%
Somewhat true	7.7%	4.9%	8.8%	14.3%	3.1%	3.5%	10.7%
...	23.3%	26.2%	22.5%	22.1%	23.1%	24.8%	21.5%
Very true	63.1%	63.9%	63.8%	59.7%	68.9%	63.4%	60.2%
Don't know	2.0%	3.3%	1.3%		2.2%	2.3%	3.1%
c. Participants increased their knowledge of sources or types of teaching materials							
Not true	.5%	1.7%	1.3%				
...	2.2%		3.8%	2.6%		2.5%	3.1%
Somewhat true	11.1%	10.0%	13.8%	9.2%	14.5%	9.1%	10.0%
...	27.2%	33.3%	31.3%	30.3%	15.6%	25.5%	26.2%
Very true	58.5%	55.0%	50.0%	57.9%	69.9%	59.6%	60.6%
Don't know	.6%					3.3%	
d. Participants used new materials or lessons in their classrooms							
Not true	.2%	1.6%					
...	.7%	1.6%	1.3%	1.3%			
Somewhat true	5.8%	4.9%	10.0%	2.6%	1.7%	6.5%	7.7%
...	17.3%	26.2%	20.0%	19.5%	15.8%	10.8%	13.5%
Very true	72.6%	54.1%	66.3%	75.3%	82.5%	79.1%	76.6%
Don't know	3.3%	11.5%	2.5%	1.3%		3.6%	2.3%
e. Participants disseminated methods or materials from the project by leading in-service sessions in their districts							
Not true	5.5%	11.5%	8.9%	2.6%	4.0%	1.3%	5.5%
...	7.9%	1.6%	8.9%	6.6%	10.8%	11.1%	7.5%
Somewhat true	24.1%	16.4%	25.3%	30.3%	12.6%	27.6%	28.5%
...	21.2%	23.0%	24.1%	23.7%	14.2%	19.3%	22.2%
Very true	33.2%	29.5%	21.5%	34.2%	55.2%	34.6%	28.6%

Responses are weighted to represent all awardees

(continued)

22. To what extent does each statement describe your project or its results?	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Don't know	8.1%	18.0%	11.4%	2.6%	3.1%	6.1%	7.7%
f. Participants or staff members gave presentations about the project at professional meetings							
Not true	5.1%	9.8%	11.4%	3.9%	2.7%	1.1%	2.1%
...	10.7%	4.9%	13.9%	11.8%	15.5%	10.7%	6.8%
Somewhat true	20.6%	19.7%	20.3%	18.4%	16.1%	19.1%	28.5%
...	20.1%	19.7%	15.2%	22.4%	19.4%	21.3%	22.8%
Very true	37.1%	34.4%	29.1%	38.2%	44.6%	43.1%	34.3%
Don't know	6.5%	11.5%	10.1%	5.3%	1.7%	4.7%	5.5%
g. Participants served as project staff members or mentors in later years of the project, or in other similar projects							
Not true	13.9%	24.6%	20.3%	16.0%	5.4%	7.8%	10.0%
...	15.0%	9.8%	11.4%	17.3%	24.6%	17.1%	11.2%
Somewhat true	16.4%	13.1%	17.7%	13.3%	15.4%	19.6%	17.9%
...	17.7%	16.4%	16.5%	20.0%	13.7%	17.6%	20.9%
Very true	28.6%	21.3%	24.1%	26.7%	37.5%	30.8%	31.2%
Don't know	8.4%	14.8%	10.1%	6.7%	3.3%	7.2%	8.7%
h. Participants remained in contact with each other after the project to discuss teaching strategies or methods							
Not true	1.8%	1.6%	3.8%	3.9%			1.2%
...	2.9%	8.2%	1.3%	2.6%	3.0%	2.5%	1.0%
Somewhat true	22.7%	23.0%	28.8%	19.5%	30.4%	14.7%	21.2%
...	31.5%	31.1%	32.5%	26.0%	27.3%	37.8%	33.0%
Very true	34.3%	27.9%	25.0%	40.3%	39.3%	36.9%	36.7%
Don't know	6.8%	8.2%	8.8%	7.8%		8.1%	6.8%
i. Participants remained in contact with project staff							
Not true	1.4%	1.7%	2.5%	2.6%			1.2%
...	5.7%	8.3%	7.5%	3.9%	5.4%	4.6%	4.6%
Somewhat true	23.2%	25.0%	32.5%	14.3%	26.8%	15.4%	25.3%
...	31.4%	28.3%	31.3%	46.8%	29.5%	32.3%	20.0%
Very true	36.9%	35.0%	25.0%	32.5%	38.3%	43.0%	47.7%
Don't know	1.5%	1.7%	1.3%			4.6%	1.1%
j. Participant established working partnership withlocal science resource (e.g., college, museum, etc.)							
Not true	15.0%	18.0%	19.0%	13.5%	13.5%	11.7%	14.3%
...	11.8%	9.8%	19.0%	10.8%	11.7%	10.6%	7.9%

(continued)

Responses are weighted to represent all awardees

22. To what extent does each statement describe your project or its results?	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Somewhat true	22.1%	13.1%	20.3%	20.3%	33.9%	28.4%	17.3%
...	18.1%	13.1%	16.5%	27.0%	19.4%	16.1%	16.8%
Very true	12.0%	13.1%	7.6%	13.5%	8.7%	15.4%	13.3%
Don't know	21.0%	32.8%	17.7%	14.9%	12.8%	17.8%	30.4%
k. Participants' home school districts provided adequate support for using the content or methods learned in the project							
Not true	2.6%	8.2%	3.8%	1.3%	2.2%	1.0%	
...	4.0%	4.9%	8.8%	1.3%	1.5%	2.4%	4.5%
Somewhat true	21.9%	14.8%	27.5%	22.1%	23.8%	25.8%	16.2%
...	35.5%	27.9%	21.3%	48.1%	45.2%	34.9%	37.4%
Very true	22.0%	14.8%	20.0%	20.8%	24.2%	25.3%	26.0%
Don't know	14.0%	29.5%	18.8%	6.5%	3.2%	10.7%	16.0%
l.The project increased the collaboration between scientists or mathematicians and educational specialists at host insti							
Not true	16.1%	19.7%	20.3%	13.3%	16.6%	17.2%	10.1%
...	12.3%	11.5%	13.9%	9.3%	7.4%	15.3%	14.8%
Somewhat true	20.1%	16.4%	25.3%	22.7%	27.2%	15.3%	14.5%
...	18.1%	13.1%	20.3%	17.3%	24.7%	17.7%	16.1%
Very true	27.3%	31.1%	15.2%	33.3%	21.7%	27.8%	35.3%
Don't know	6.0%	8.2%	5.1%	4.0%	2.3%	6.6%	9.1%
m.One or more journal publications resulted from the project							
Not true	32.7%	34.4%	49.4%	30.3%	21.6%	23.2%	34.3%
...	9.9%	6.6%	13.0%	6.6%	15.2%	6.3%	12.1%
Somewhat true	5.1%	4.9%	3.9%	9.2%	1.9%	7.0%	3.4%
...	8.2%	4.9%	1.3%	10.5%	16.0%	10.6%	7.3%
Very true	32.3%	32.8%	23.4%	36.8%	36.7%	35.1%	30.5%
Don't know	11.8%	16.4%	9.1%	6.6%	8.6%	17.8%	12.4%
n.Promises for cost-sharing by other organizations were honored							
Not true	13.7%	20.0%	25.0%	10.7%	8.0%	8.6%	9.5%
...	2.5%	8.3%	2.6%			2.2%	2.2%
Somewhat true	6.2%	5.0%	3.9%	8.0%	5.2%	6.6%	8.0%
...	16.2%	8.3%	9.2%	18.7%	21.7%	22.4%	16.5%
Very true	54.5%	46.7%	44.7%	54.7%	62.1%	57.9%	60.6%
Don't know	7.1%	11.7%	14.5%	8.0%	2.9%	2.3%	3.2%
o.Arrangements for cost sharing led to continued collaboration after the project							
Not true	25.9%	41.7%	41.7%	21.9%	14.2%	19.7%	16.8%

Responses are weighted to represent all awardees

(continued)

22. To what extent does each statement describe your project or its results?	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
...	7.9%	10.0%	6.9%	8.2%	10.4%	7.0%	5.7%
Somewhat true	13.4%	5.0%	6.9%	23.3%	14.5%	11.6%	18.5%
...	14.1%	10.0%	5.6%	13.7%	10.6%	20.9%	22.3%
Very true	23.2%	16.7%	18.1%	23.3%	39.1%	24.5%	19.2%
Don't know	15.5%	16.7%	20.8%	9.6%	11.2%	16.4%	17.6%

Responses are weighted to represent all awardees

23. What types of data were collected?	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
All awards	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
By your project's staff							
Measures of participants' content knowledge	36.3%	29.0%	27.5%	42.9%	44.5%	34.8%	40.1%
Measures of participants' interest, confidence or other attitudes	43.1%	27.4%	36.3%	48.1%	55.5%	44.4%	47.0%
Participants' ratings or evaluation of the project	61.1%	56.5%	61.3%	66.2%	68.4%	55.0%	60.0%
Participants' records of their use of project-taught methods or content in their home classroom	46.4%	27.4%	38.8%	54.5%	55.0%	49.7%	51.7%
Project staffs' observations and/or ratings of participants' teaching methods	35.5%	27.4%	20.0%	40.3%	53.7%	35.7%	39.1%
Measures of student interest or motivation for science or mathematics	19.2%	9.7%	11.3%	24.7%	33.9%	18.3%	19.3%
Measures of student learning of science or mathematics	13.7%	8.1%	8.8%	14.3%	22.0%	14.4%	15.4%
Data from administrators/supervisors in participants' home schools	18.7%	12.9%	11.3%	24.7%	21.4%	22.4%	19.6%
Control or comparison group data	10.1%	6.5%	6.3%	11.7%	16.8%	12.2%	8.3%
Pre-post measures	35.9%	25.8%	25.0%	40.3%	45.2%	36.4%	43.2%
Other	6.3%	1.6%	3.8%	6.5%	16.9%	8.5%	2.1%
None of the above	29.9%	38.7%	38.8%	22.1%	19.2%	34.1%	25.4%
By an outside evaluator							
Measures of participants' content knowledge	8.7%	1.6%	5.0%	7.8%	18.7%	7.3%	12.5%
Measures of participants' interest, confidence or other attitudes	19.0%	8.1%	10.0%	16.9%	24.1%	27.1%	26.8%
Participants' ratings or evaluation of the project	20.8%	12.9%	10.0%	16.9%	22.5%	31.4%	30.2%
Participants' records of their use of project-taught methods or content in their home classroom	11.0%	6.5%	7.5%	10.4%	8.9%	15.4%	16.0%
Project staffs' observations and/or ratings of participants' teaching methods	6.1%	3.2%	1.3%	5.2%	8.5%	10.3%	8.4%
Measures of student interest or motivation for science or mathematics	7.5%	1.6%	3.8%	7.8%	11.8%	7.6%	12.3%
Measures of student learning of science or mathematics	5.0%	1.6%	2.5%	3.9%	10.0%	2.4%	9.9%
Data from administrators/supervisors in participants' home schools	6.2%	1.6%	1.3%	9.1%	8.7%	7.2%	9.4%

(continued)

Responses are weighted to represent all awardees

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23. What types of data were collected?	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Control or comparison group data	3.8%	1.6%		1.3%	5.6%	6.5%	7.9%
Pre-post measures	11.0%	1.6%	3.8%	10.4%	16.7%	15.6%	17.3%
Other	3.0%		1.3%	1.3%	6.2%	6.3%	3.2%
None of the above	72.8%	87.1%	86.3%	77.9%	64.9%	61.9%	59.9%
By either project or outside evaluator							
Measures of participants' content knowledge	41.8%	29.0%	31.3%	48.1%	51.5%	42.1%	49.3%
Measures of participants' interest, confidence or other attitudes	54.6%	32.3%	40.0%	59.7%	66.4%	61.5%	66.3%
Participants' ratings or evaluation of the project	72.9%	62.9%	63.8%	76.6%	76.3%	77.0%	80.3%
Participants' records of their use of project-taught methods or content in their home classroom	53.0%	32.3%	42.5%	61.0%	56.5%	59.7%	63.3%
Project staffs' observations and/or ratings of participants' teaching methods	37.9%	27.4%	20.0%	42.9%	53.7%	41.4%	44.5%
Measures of student interest or motivation for science or mathematics	24.4%	9.7%	13.8%	28.6%	40.0%	25.8%	29.3%
Measures of student learning of science or mathematics	16.6%	8.1%	10.0%	15.6%	27.8%	16.9%	22.1%
Data from administrators/supervisors in participants' home schools	22.4%	12.9%	11.3%	31.2%	24.2%	27.2%	27.0%
Control or comparison group data	12.8%	8.1%	6.3%	11.7%	19.6%	16.9%	15.1%
Pre-post measures	42.0%	25.8%	26.3%	45.5%	53.2%	48.4%	52.7%
Other	8.0%	1.6%	5.0%	7.8%	18.6%	12.7%	3.2%
None of the above	24.5%	33.9%	36.3%	16.9%	19.2%	23.0%	17.6%

Responses are weighted to represent all awardees

24. Subsequent use of materials	All awards	Fiscal year of award				
		1984	1985	1986	1987	1988
All awards	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
In what ways were project materials used ... one year after the project ended?						
Participants using in their own classes	86.4%	86.7%	87.0%	82.4%	100.0%	58.3%
Participants sharing with other teachers	80.6%	86.7%	75.3%	78.4%	94.3%	58.3%
School districts using for workshops funded by NSF	11.3%	13.3%	10.4%	5.9%	27.1%	
School districts using for workshops funded by sources other than NSF	32.2%	30.0%	29.9%	29.4%	67.3%	
Your institution using for in-service teacher education funded by NSF	21.8%	21.7%	23.4%	13.7%	33.8%	58.3%
Your institution using for in-service teacher education funded by sources other than NSF	43.1%	36.7%	37.7%	49.0%	75.7%	58.3%
None of the above or unknown	12.6%	10.0%	13.0%	17.6%		41.7%

Responses are weighted to represent all awardees

25. Indicate financial or other types of support from sources other than NSF	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
All awards	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Support in dollars							
Host institution	42.0%	32.3%	31.3%	37.7%	49.2%	55.6%	45.8%
Other college or university	4.6%	4.8%	1.3%	3.9%	11.3%	1.7%	6.3%
Federally funded R&D laboratory	1.5%		1.3%	1.3%	4.1%	1.3%	1.0%
Federal government agency	7.6%	4.8%	5.0%	3.9%	8.2%	11.7%	11.2%
State government agency	14.5%	8.1%	10.0%	9.1%	24.5%	15.8%	20.2%
Local government agency	4.6%	3.2%	1.3%	3.9%	7.7%	6.5%	5.4%
Foundation, or educational trust funds	15.0%	4.8%	8.8%	13.0%	24.4%	19.8%	19.0%
Museum	1.3%			1.3%		3.0%	3.1%
Zoo	.5%			1.3%		1.7%	
School or district of participating teacher	42.8%	29.0%	22.5%	41.6%	58.8%	53.1%	53.3%
Other non-profit organization	5.7%	3.2%	1.3%	5.2%	4.4%	11.8%	7.9%
Private industry/for-profit organization	18.0%	9.7%	12.5%	14.3%	29.9%	20.1%	22.1%
Individuals	5.6%	3.2%	5.0%	5.2%	12.0%	8.8%	
Participating teachers, individually	15.4%	16.1%	15.0%	16.9%	11.7%	16.8%	15.4%
Yourself, and/or other staff members	9.2%	11.3%	8.8%	7.8%	4.4%	13.4%	9.0%
Other source	.4%					1.2%	1.1%
None of the above	28.5%	40.3%	43.8%	28.6%	12.3%	20.0%	24.3%
Support in kind							
Host institution	82.3%	83.9%	73.8%	87.0%	84.3%	88.4%	78.1%
Other college or university	13.3%	6.5%	10.0%	15.6%	14.7%	11.1%	20.8%
Federally funded R&D laboratory	5.3%	8.1%	1.3%	5.2%	5.7%	9.1%	3.2%
Federal government agency	4.5%	1.6%	5.0%	2.6%	1.5%	7.5%	7.5%
State government agency	12.9%	3.2%	11.3%	16.9%	13.2%	15.8%	15.6%
Local government agency	7.3%	3.2%	5.0%	11.7%	4.8%	10.8%	7.2%
Foundation, or educational trust funds	2.3%	1.6%		5.2%		1.4%	5.4%
Museum	11.1%	9.7%	3.8%	15.6%	1.4%	13.9%	20.5%
Zoo	3.8%	3.2%	1.3%	9.1%		5.6%	3.4%
School or district of participating teacher	46.3%	19.4%	41.3%	49.4%	54.4%	57.9%	52.0%
Other non-profit organization	6.3%	3.2%	1.3%	6.5%	7.6%	9.3%	10.1%
Private industry/for-profit organization	23.1%	24.2%	18.8%	19.5%	25.1%	28.7%	23.2%
Individuals	7.6%	4.8%	7.5%	9.1%	10.3%	10.1%	4.2%
Participating teachers, individually	15.7%	12.9%	16.3%	22.1%	11.3%	15.4%	15.2%
Yourself, and/or other staff members	31.9%	27.4%	30.0%	33.8%	33.2%	32.6%	34.0%
Other source	1.3%	1.6%	1.3%			1.2%	3.2%
None of the above	8.3%	14.5%	12.5%	7.8%	7.8%	4.6%	3.3%

Responses are weighted to represent all awardees

Current dollars

26. Please indicate the funding for your project from all sources	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Funding from NSF - 1984	4,874,559	4,109,870	636,118	128,571	.	.	.
Mean	82,464	88,170	56,796	99,000	.	.	.
Median	60,000	62,000	56,000	99,000	.	.	.
1985	11,581,596	3,683,288	7,290,721	300,649	.	306,937	.
Mean	87,915	81,413	88,265	115,750	.	236,767	.
Median	60,000	65,000	58,000	115,750	.	236,767	.
1986	14,706,765	1,680,578	5,461,516	6,753,631	424,938	386,102	.
Mean	97,026	94,295	97,527	94,551	107,443	162,999	.
Median	70,000	40,000	68,668	80,000	120,000	153,374	.
1987	19,016,664	.	2,822,670	6,681,830	8,486,060	1,026,104	.
Mean	116,530	.	106,115	107,188	128,419	125,559	.
Median	100,000	.	80,000	85,515	109,000	141,838	.
1988	23,836,816	.	728,494	4,010,494	6,394,921	10,703,258	1,999,648
Mean	108,586	.	74,336	93,578	111,425	116,298	114,669
Median	92,000	.	64,260	77,000	90,000	112,861	99,503
1989	36,047,942	.	439,065	1,481,868	4,782,798	13,906,823	15,437,388
Mean	151,890	.	156,809	71,315	134,922	172,179	158,281
Median	120,338	.	156,809	55,114	123,696	112,861	142,947
1990	24,618,804	.	449,385	693,397	886,660	8,180,639	14,408,723
Mean	143,805	.	320,989	106,783	59,847	126,294	172,123
Median	128,627	.	320,989	53,321	30,000	112,861	153,864
Other sources - 1984	689,321	545,946	86,660	.	56,716	.	.
Mean	20,552	20,959	15,475	.	29,978	.	.
Median	12,000	12,000	5,550	.	29,978	.	.
1985	2,094,588	505,283	1,517,061	13,636	14,022	44,586	.
Mean	30,242	24,571	34,955	5,250	10,000	34,393	.
Median	12,000	14,380	10,000	5,250	10,000	34,393	.
1986	3,837,907	327,741	951,278	1,807,772	432,882	338,234	.
Mean	38,841	23,906	29,543	43,500	47,246	125,476	.
Median	12,500	13,407	10,000	10,288	45,000	40,000	.
1987	5,524,281	54,839	564,913	2,084,411	2,414,967	390,675	14,477
Mean	53,540	40,000	36,683	53,500	57,421	99,074	10,000
Median	14,000	40,000	8,559	11,865	20,000	34,027	10,000
1988	8,124,783	20,565	227,485	2,121,502	3,493,212	1,872,693	389,326
Mean	55,627	15,000	40,622	81,678	78,099	34,748	26,865
Median	20,000	15,000	13,845	11,500	24,000	20,000	21,000

(continued)

Responses are weighted to represent all awardees

Current dollars

26. Please indicate the funding for your project from all sources	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
1989	10,127,698	.	53,383	255,032	1,567,783	2,070,390	6,181,109
Mean	69,114	.	19,066	17,852	55,616	47,430	107,291
Median	21,000	.	19,066	3,200	35,641	20,000	24,000
1990	8,431,462	136	190,028	67,440	749,666	2,529,610	4,894,582
Mean	67,206	99	67,867	17,310	37,951	57,721	90,959
Median	26,000	99	67,867	13,729	25,000	25,000	39,616
In-kind contributions 1984	1,221,800	998,601	184,800	19,481	18,919	.	.
Mean	23,137	26,977	14,667	15,000	10,000	.	.
Median	10,000	10,000	15,000	15,000	10,000	.	.
1985	1,869,804	629,835	1,219,190	20,779	.	.	.
Mean	17,743	16,407	18,932	8,000	.	.	.
Median	10,000	11,000	10,000	8,000	.	.	.
1986	3,132,795	175,256	1,112,103	1,479,257	331,198	34,981	.
Mean	26,254	10,653	26,479	26,489	91,234	25,000	.
Median	13,000	10,000	15,000	10,000	100,000	25,000	.
1987	4,494,810	7,540	678,926	1,386,406	2,156,257	65,681	.
Mean	32,213	2,750	37,304	29,084	36,887	11,748	.
Median	16,667	2,750	20,000	15,000	20,000	15,000	.
1988	6,659,765	6,855	388,984	1,387,515	2,493,869	1,856,519	526,022
Mean	36,411	5,000	46,308	35,613	54,090	25,681	33,344
Median	15,000	5,000	39,500	20,884	12,000	15,000	29,004
1989	8,527,689	.	162,806	377,922	1,767,620	2,327,856	3,891,485
Mean	42,071	.	38,763	29,100	55,476	34,731	44,925
Median	20,000	.	20,000	11,500	16,667	18,000	24,700
1990	6,985,709	.	162,848	211,619	951,278	2,190,664	3,469,299
Mean	46,599	.	38,773	40,737	66,033	42,275	46,699
Median	24,000	.	20,000	16,474	15,000	20,000	27,522

Responses are weighted to represent all awardees

Constant (1984) dollars

26. Please indicate the funding for your project from all sources	All awards	Fiscal year of award 1984	1985	1986	1987	1988	1989
Funding from NSF - 1984	4,874,559	4,109,870	636,118	128,571	.	.	.
Mean	82,464	88,170	56,796	99,000	.	.	.
Median	60,000	62,000	56,000	99,000	.	.	.
1985	11,245,474	3,576,391	7,079,129	291,924	.	298,029	.
Mean	85,364	79,050	85,704	112,391	.	229,896	.
Median	58,259	63,114	56,317	112,391	.	229,896	.
1986	13,906,432	1,589,122	5,164,304	6,386,103	401,813	365,091	.
Mean	91,746	89,163	92,220	89,405	101,596	154,129	.
Median	66,191	37,823	64,931	75,646	113,470	145,027	.
1987	17,410,259	.	2,584,229	6,117,392	7,769,213	939,426	.
Mean	106,686	.	97,151	98,133	117,571	114,953	.
Median	91,553	.	73,242	78,291	99,792	129,856	.
1988	21,187,626	.	647,530	3,564,773	5,684,199	9,513,713	1,777,410
Mean	96,518	.	66,075	83,178	99,042	103,373	101,925
Median	81,775	.	57,118	68,442	79,998	100,318	88,444
1989	30,847,921	.	375,729	1,268,105	4,092;865	11,900,723	13,210,499
Mean	129,980	.	134,189	61,028	115,459	147,342	135,448
Median	102,979	.	134,189	47,163	105,852	96,580	122,326
1990	20,341,952	.	371,316	572,938	732,627	6,759,474	11,905,597
Mean	118,823	.	265,226	88,233	49,450	104,354	142,221
Median	106,282	.	265,226	44,058	24,788	93,254	127 134
Other sources - 1984	689,321	545,946	86,660	.	56,716	.	.
Mean	20,552	20,959	15,475	.	29,978	.	.
Median	12,000	12,000	5,550	.	29,978	.	.
1985	2,033,799	490,618	1,473,033	13,241	13,615	43,292	.
Mean	29,364	23,858	33,941	5,098	9,710	33,395	.
Median	11,652	13,963	9,710	5,098	9,710	33,395	.
1986	3,647,962	309,905	899,510	1,709,394	409,325	319,828	.
Mean	36,727	22,605	27,935	41,132	44,675	118,648	.
Median	11,820	12,677	9,456	9,728	42,551	37,823	.
1987	5,057,626	50,206	517,192	1,908,334	2,210,966	357,673	13,254
Mean	49,017	36,621	33,584	48,981	52,570	90,704	9,155
Median	12,817	36,621	7,836	10,862	18,311	31,153	9,155
1988	7,221,806	18,279	202,202	1,885,721	3,104,982	1,664,565	346,057
Mean	49,445	13,333	36,108	72,600	69,420	30,887	23,879
Median	17,777	13,333	12,306	10,222	21,333	17,777	18,666

(continued)

Responses are weighted to represent all awardees

Constant (1984) dollars

26. Please indicate the funding for your project from all sources	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
1989	8,666,748	.	45,683	218,243	1,341,626	1,771,731	5,289,466
Mean	59,144	.	16,315	15,277	47,593	40,588	91,814
Median	17,971	.	16,315	2,738	30,500	17,115	20,538
1990	6,966,724	112	157,015	55,724	619,432	2,090,159	4,044,281
Mean	55,531	82	56,077	14,303	31,358	47,693	75,157
Median	21,483	82	56,077	11,344	20,657	20,657	32,734
In-kind contributions 1984	1,221,800	998,601	184,800	19,481	18,919	.	.
Mean	23,137	26,977	14,667	15,000	10,000	.	.
Median	10,000	10,000	15,000	15,000	10,000	.	.
1985	1,815,539	611,556	1,183,807	20,176	.	.	.
Mean	17,228	15,931	18,382	7,768	.	.	.
Median	9,710	10,681	9,710	7,768	.	.	.
1986	2,962,310	165,719	1,051,583	1,398,757	313,175	33,077	.
Mean	24,826	10,073	25,038	25,048	86,269	23,640	.
Median	12,293	9,456	14,184	9,456	94,558	23,640	.
1987	4,115,117	6,903	621,575	1,452,397	1,974,110	60,132	.
Mean	29,492	2,518	34,152	26,627	33,771	10,755	.
Median	15,259	2,518	18,311	13,733	18,311	13,733	.
1988	5,919,608	6,093	345,753	1,233,309	2,216,704	1,650,188	467,561
Mean	32,364	4,444	41,161	31,655	48,079	22,827	29,638
Median	13,333	4,444	35,110	18,563	10,666	13,333	25,781
1989	7,297,545	.	139,321	323,406	1,512,635	1,992,056	3,330,127
Mean	36,002	.	33,172	24,902	47,474	29,721	38,444
Median	17,115	.	17,115	9,841	14,263	15,403	21,137
1990	5,772,131	.	134,558	174,856	786,019	1,810,095	2,866,602
Mean	38,503	.	32,038	33,660	54,561	34,930	38,586
Median	19,831	.	16,526	13,612	12,394	16,526	22,741

Responses are weighted to represent all awardees

27-28. Principal Investigator's affiliation	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
All awards	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
What was the P.I.'s primary employment base at the time of award?							
University or 4-year college	84.4%	95.2%	91.3%	81.8%	81.0%	79.3%	78.8%
Community or junior college	.2%						1.1%
Federally funded R&D laboratory	1.1%			1.3%	1.8%	2.3%	1.0%
State government agency	.6%				1.5%	1.1%	1.0%
Local government agency	.2%						1.1%
Museum	1.9%		1.3%	3.9%	1.4%	2.5%	2.0%
Zoo	.7%			1.3%		2.5%	
Public or private elementary or secondary school	4.4%	1.6%	5.0%	6.5%	4.8%	4.7%	3.6%
Other non-profit organization	4.8%	1.6%	2.5%	2.6%	9.5%	5.4%	7.7%
Private industry/for profit organization	.5%						2.6%
Other	1.3%	1.6%		2.6%		2.3%	1.0%
If P.I. was affiliated with a college or university at the time of award, in what type of department was his or her majo							
Mathematics department	16.8%	13.6%	15.1%	17.5%	22.2%	15.0%	18.7%
Any science department	56.9%	69.5%	65.8%	58.7%	48.9%	51.3%	44.5%
Education school or department	18.7%	10.2%	13.7%	20.6%	23.4%	23.0%	22.7%
A center or institute	4.2%	1.7%	2.7%	1.6%	3.5%	5.9%	9.9%
Other	3.4%	5.1%	2.7%	1.6%	2.1%	4.8%	4.2%

Responses are weighted to represent all awardees

29-32. Principal Investigator's background and experience	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
All awards	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Did the P.I. have tenure at this college or university at the time of award?							
Yes	83.5%	81.0%	86.3%	88.7%	86.9%	80.3%	78.3%
No	16.5%	19.0%	13.7%	11.3%	13.1%	19.7%	21.7%
How many teacher enhancement projects (for pre-collegeteachers) had the PI directed prior to this project?							
None	42.4%	43.5%	46.3%	38.2%	44.5%	37.9%	44.0%
1 to 3	34.3%	37.1%	30.0%	32.9%	33.5%	37.2%	35.9%
4 or more	23.3%	19.4%	23.8%	28.9%	22.0%	24.9%	20.1%
What was the P.I.'s highest level of earned degree at the time of award?							
Bachelors	2.3%		2.5%	2.6%	3.3%	2.6%	2.3%
Masters	10.2%	4.8%	10.0%	9.1%	11.5%	13.0%	12.1%
Doctorate	87.5%	95.2%	87.5%	88.3%	85.3%	84.4%	85.6%
In what field was the P.I.'s highest earned degree?							
Astronomy	.6%	1.6%				1.1%	1.2%
Biological Sciences	13.8%	21.0%	11.3%	15.6%	10.7%	14.2%	11.2%
Chemistry	11.8%	16.1%	12.5%	7.8%	10.8%	12.7%	11.3%
Computer Sciences	1.1%		2.5%	1.3%	1.3%	1.1%	
Earth Sciences	6.5%	9.7%	7.5%	5.2%	4.2%	5.0%	7.6%
Economics	.9%	1.6%		1.3%		1.4%	1.0%
Engineering	1.1%		1.3%			1.3%	3.2%
Mathematical Sciences	10.3%	4.8%	6.3%	11.7%	11.9%	13.8%	13.0%
Oceanography	.3%				2.2%		
Physics	14.6%	16.1%	23.8%	10.4%	14.8%	10.0%	12.0%
Political Science	.5%		1.3%	1.3%			
Psychology	.7%				3.2%	1.2%	
Sociology	.4%					1.2%	1.2%
Science Education	19.0%	16.1%	17.5%	29.9%	16.4%	19.1%	14.8%
Mathematics Education	9.3%	9.7%	7.5%	7.8%	14.5%	11.9%	5.5%
Other Education	6.3%	3.2%	6.3%	6.5%	4.5%	5.1%	11.2%
Other Field	2.9%		2.5%	1.3%	5.4%	1.0%	6.8%

Responses are weighted to represent all awardees

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33-36. Characteristics of the principal investigator	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
All awards	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
What is the PI's sex?							
Male	77.4%	80.6%	81.3%	79.2%	73.4%	76.1%	73.9%
Female	22.6%	19.4%	18.8%	20.8%	26.6%	23.9%	26.1%
What is the PI's race/ethnicity?							
White, of not Hispanic origin	94.4%	95.2%	91.3%	97.4%	98.6%	90.7%	94.4%
Black, not of Hispanic origin	2.4%	1.6%	2.5%	1.3%	1.4%	4.9%	2.3%
Hispanic	.8%	1.6%	1.3%			2.2%	
Asian or Pacific Islander	1.3%	1.6%	1.3%			2.3%	2.3%
Native American or Alaskan native	1.1%		3.8%	1.3%			1.0%
Does the PI have a disability or handicap that limits a major life activity?							
Yes	4.5%	6.6%	2.5%	5.2%	5.9%	2.2%	5.6%
No	95.5%	93.4%	97.5%	94.8%	94.1%	97.8%	94.4%
What was the PI's age at time of award?							
30 to 39	12.4%	21.0%	11.4%	9.3%	21.1%	11.2%	3.6%
40 to 49	47.1%	50.0%	48.1%	49.3%	41.9%	45.1%	47.9%
50 to 59	31.9%	22.6%	34.2%	36.0%	27.7%	32.9%	35.7%
60 or older	8.5%	6.5%	6.3%	5.3%	9.3%	10.7%	12.8%
Median	47	46	47	48	48	48	49

Responses are weighted to represent all awardees

37-39. Staffing	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Please estimate the total number of person-days the principal investigator spent on the project in one project year.							
Mean	81	69	70	79	99	85	84
Median	60	60	50	60	90	60	75
In addition to the Principal Investigator, how many other persons served as co-investigators or instructional staff memb							
Mean	6	6	5	5	5	6	6
Median	4	4	3	4	4	4	4
Please indicate the types of persons who served as co-investigators or instructional staff members							
College or University faculty members in mathematics or computer science	31.2%	38.7%	38.8%	25.0%	32.8%	25.3%	27.6%
College or University faculty members in science	62.2%	74.2%	67.5%	50.0%	60.2%	55.9%	66.3%
College or University faculty members from education school or department	39.2%	27.4%	25.0%	38.2%	46.4%	42.5%	55.2%
Postdoctoral fellows	3.3%		1.3%	7.9%	2.9%	3.8%	3.9%
Graduate students	30.1%	38.7%	26.3%	26.3%	31.6%	35.3%	24.5%
Federally funded R&D laboratory staff	3.1%	4.8%	1.3%	3.9%	1.9%	3.7%	3.4%
Federal government agency staff	3.7%	4.8%	7.5%	1.3%	1.5%	3.2%	3.2%
State government agency staff	10.4%	3.2%	7.5%	13.2%	12.9%	10.3%	14.5%
Local government agency staff	2.8%	1.6%	2.5%	2.6%	3.2%	4.6%	2.1%
Foundation staff	1.0%			2.6%	1.5%	1.1%	1.1%
Museum staff	11.0%	8.1%	7.5%	17.1%	2.9%	13.4%	15.0%
Zoo staff	3.8%	3.2%	1.3%	9.2%		5.1%	3.4%
Former project participants	28.3%	21.0%	18.8%	30.3%	31.4%	36.2%	31.7%
Pre-college teachers who were not former participants	33.6%	17.7%	26.3%	43.4%	35.0%	39.1%	38.1%
Administrators at pre-college educational level	8.4%	4.8%	5.0%	5.3%	14.0%	6.6%	15.3%
Curricular specialists from pre-college institutions	13.0%	3.2%	7.5%	15.8%	15.7%	15.7%	18.9%
Other non-profit organization staff	7.2%	6.5%	5.0%	9.2%	7.5%	4.3%	10.7%
Persons from private industry	15.6%	16.1%	12.5%	13.2%	23.2%	14.6%	15.5%
Undergraduate students	2.7%	3.2%	7.5%	2.6%		2.1%	
Other	11.6%	6.5%	10.0%	17.1%	7.2%	11.5%	15.7%
None of the above	1.3%	1.6%	2.5%	1.3%			2.1%

Responses are weighted to represent all awardees

39. Average annual person-days provided	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Total for all staff members (excluding PI)	163	101	137	139	189	184	212
College or University faculty members in mathematics or computer science	51	37	54	31	64	48	62
College or University faculty members in science	65	63	66	57	67	60	71
College or University faculty members from education school or department	43	22	43	45	51	47	41
Postdoctoral fellows	20	.	2	16	55	5	30
Graduate students	57	39	60	36	75	69	55
Federally funded R&D laboratory staff	37	2	2	91	10	48	12
Federal government agency staff	12	8	16	16	2	13	9
State government agency staff	20	23	4	19	7	6	46
Local government agency staff	30	.	15	.	84	9	21
Foundation staff	5	.	.	6	1	2	10
Museum staff	75	3	4	73	25	152	86
Zoo staff	35	3	1	42	.	82	2
Former project participants	55	25	31	38	60	70	73
Pre-college teachers who were not former participants	74	37	93	77	64	58	90
Administrators at pre-college educational level	34	11	5	22	70	11	30
Curricular specialists from pre-college institutions	35	2	22	23	58	40	31
Other non-profit organization staff	70	2	22	58	74	19	132
Persons from private industry	18	3	29	12	14	7	45
Other	60	51	52	43	75	70	70

Note: averages are based on positive responses

Responses are weighted to represent all awardees

40. Respond briefly to any of the following questions that you wish	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Responded	87.3%	95.2%	83.8%	85.7%	83.8%	85.6%	90.8%
Did not respond	12.7%	4.8%	16.3%	14.3%	16.2%	14.4%	9.2%
What do you believe is the most significant accomplishment of your project?							
Respondents to this item	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Improve knowledge of science or math	21.8%	18.6%	22.4%	27.3%	17.4%	19.7%	24.3%
Increase teachers' knowledge of science or math principle ap	10.8%	1.7%	13.4%	16.7%	13.1%	9.8%	9.9%
Develop ways for teachers to enhance student interest	7.0%	3.4%	10.4%	3.0%	13.8%	7.9%	4.6%
Develop skills for improving student problem solving	4.9%	3.4%	3.0%	3.0%	12.0%	4.2%	5.2%
Construct, investigate, or refine teaching materials	11.4%	10.2%	11.9%	15.2%	9.5%	10.5%	10.9%
Provide experience with hands on activities	13.0%	8.5%	14.9%	13.6%	13.5%	11.1%	15.7%
Develop ways to integrate science or math instruction	2.4%	5.1%	1.5%	1.5%	3.3%	1.4%	2.3%
Help teachers update teaching practices	27.7%	25.4%	23.9%	30.3%	17.1%	33.3%	33.3%
Enhance participants' self confidence	19.4%	18.6%	22.4%	12.1%	21.5%	19.5%	21.9%
Develop participants' abilities to lead in-service training	14.1%	11.9%	11.9%	12.1%	18.6%	15.3%	15.6%
Develop participants' abilities to work with other sources	7.5%	6.8%	7.5%	9.1%	3.4%	11.9%	5.9%
Teaching handicapped pupils	1.0%	1.7%	1.5%		1.6%		1.2%
Formation of participant network	17.7%	15.3%	13.4%	16.7%	14.0%	20.5%	24.9%
Teaching skills: computers, photography, etc.	3.3%	3.4%	4.5%	1.5%	3.5%	6.9%	
Teaching minorities	1.7%		1.5%	1.5%	1.7%	4.3%	1.2%
Revitalization, renewed enthusiasm for teaching	13.4%	15.3%	13.4%	12.1%	12.9%	10.7%	15.9%
Increased professional development	3.8%	1.7%	7.5%	6.1%	2.1%	2.7%	2.5%
Continued participant contact with program sponsor	3.4%	3.4%	4.5%	4.5%	3.8%	3.2%	1.2%
Increasing participants' knowledge of teaching techniques	7.0%	5.1%	7.5%	7.6%	7.2%	7.0%	7.2%

Responses are weighted to represent all awardees

40. Respond briefly to any of the following questions that you wish	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Responded	54.5%	54.8%	51.3%	59.7%	52.2%	51.7%	57.2%
Did not respond	45.5%	45.2%	48.8%	40.3%	47.8%	48.3%	42.8%
What are the specific lessons learned from your project that you would like to pass on?							
Respondents to this item	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Need for hands on approach	23.6%	32.4%	41.5%	17.4%	11.4%	21.3%	17.3%
Do a few things well	6.0%	8.8%		4.3%	6.0%	8.2%	9.3%
Focus on leadership development	18.4%	17.6%	12.2%	26.1%	9.8%	20.4%	21.5%
Involve participants in planning or setting goals	17.3%	11.8%	22.0%	17.4%	19.7%	12.8%	19.3%
Industry, non-profit, or other organizations very helpful	3.6%	2.9%	4.9%	8.7%		4.4%	
Networking	9.0%	5.9%	7.3%	6.5%	11.5%	8.7%	13.7%
Get more committment from school districts for support	36.0%	23.5%	26.8%	45.7%	42.0%	39.8%	36.8%
Provide social or other opportunities for teachers	7.7%	8.8%	7.3%	6.5%	11.9%		12.1%
Multiple year involvement works best	11.6%	5.9%	9.8%	15.2%	17.1%	9.9%	11.5%

Responses are weighted to represent all awardees

40. Respond briefly to any of the following questions that you wish	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Responded	52.9%	50.0%	48.8%	50.6%	55.3%	53.5%	58.9%
Did not respond	47.1%	50.0%	51.3%	49.4%	44.7%	46.5%	41.1%
In your mind, is there a particular model that has great promise for enhancing teacher skills?							
Respondents to this item	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Long term contact with teachers	9.7%	9.7%	7.7%	10.3%	13.4%	11.0%	7.3%
Top teachers teach others - Role models	40.4%	22.6%	46.2%	43.6%	39.5%	43.5%	42.6%
Establish local teacher resource networks	10.6%	16.1%	5.1%	5.1%	9.8%	16.1%	11.5%
Hands-on teaching experience is best	30.6%	41.9%	46.2%	30.8%	26.5%	24.7%	18.1%
Understand local environment, problems, and interests	5.5%	3.2%	2.6%	7.7%	5.0%	10.6%	3.6%
Mixes of new content, new ways to teach	12.8%	9.7%	7.7%	12.8%	11.5%	12.7%	20.2%
Teacher pairs, groups for enhancing learning	19.9%	25.8%	15.4%	10.3%	31.6%	13.4%	24.5%

Responses are weighted to represent all awardees

40. Respond briefly to any of the following questions that you wish	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Responded	46.3%	48.4%	48.8%	48.1%	39.4%	45.6%	46.5%
Did not respond	53.7%	51.6%	51.3%	51.9%	60.6%	54.4%	53.5%
If you were to run your project another time, what would be the single most important change?							
Respondents to this item	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
More time to plan project	13.3%	10.0%	15.4%	21.6%	3.9%	10.7%	14.5%
More extensive recruitment time, activity, or publicity	13.7%	23.3%	10.3%	5.4%	8.0%	26.2%	9.3%
Don't try to mix too broad a span of grades	1.4%	3.3%	2.6%		3.4%		
More hands on activities in project	19.0%	16.7%	20.5%	29.7%	14.2%	10.2%	20.7%
Continuing involvement of participants	27.1%	20.0%	25.6%	21.6%	29.3%	40.1%	25.9%
More follow-up support of participants	25.7%	23.3%	33.3%	32.4%	18.3%	17.8%	25.5%
More effort to influence school district, local organization	11.3%	3.3%	5.1%	16.2%	7.8%	9.9%	23.3%
Employ external evaluation	6.8%		2.6%	2.7%	15.5%	15.7%	6.6%
Measure pre- and post-program knowledge	4.9%	6.7%	2.6%	2.7%	10.9%		8.9%

Responses are weighted to represent all awardees

C02

C01

40. Respond briefly to any of the following questions that you wish	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Responded	15.0%	6.5%	12.5%	15.6%	19.6%	16.5%	18.6%
Did not respond	85.0%	93.5%	87.5%	84.4%	80.4%	83.5%	81.4%
Do you have nay other comments you would like to make?							
Respondents to this item	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Poor support from NSF	40.0%	75.0%	50.0%	50.0%	29.6%	35.4%	28.3%
Involve teachers in the learning process	61.4%	25.0%	50.0%	50.0%	70.4%	64.6%	78.0%

Responses are weighted to represent all awardees

C03

C04

40. Respond briefly to any of the following questions that you wish	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Responded	57.8%	59.7%	53.8%	59.7%	58.0%	56.9%	59.6%
Did not respond	42.2%	40.3%	46.3%	40.3%	42.0%	43.1%	40.4%
Do you have suggestions for NSF regarding support for PI's?							
Respondents to this item	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
More lead time	26.2%	32.4%	23.3%	30.4%	28.2%	19.1%	25.5%
Simplify proposal procedures or guidelines	4.4%	2.7%	4.7%	8.7%	2.4%	5.9%	1.9%
NSF needs better peer and proposal reviewers	1.2%	5.4%	2.3%				
Better criteria for PI who writes grant application	2.7%	2.7%	7.0%	2.2%		4.0%	
More communication among PI's	19.5%	16.2%	14.0%	17.4%	15.3%	22.1%	29.9%
Orientation meeting for new PI's	1.5%		2.3%	2.2%			3.7%
Newsletter for sharing information	3.3%	2.7%	4.7%	2.2%	2.3%	4.1%	3.5%
Allow release time during the project	1.9%	5.4%	2.3%			2.1%	2.0%
Simplify paperwork or organizational requirements	.7%						3.9%
Suggestions on record keeping or grant administration	1.2%	2.7%	2.3%	2.2%			
Received generally inadequate support from NSF	1.9%		2.3%	2.2%	5.6%	2.1%	
Better access to NSF support staff; unhelpful program office	11.6%	2.7%	4.7%	17.4%	11.7%	13.5%	17.7%
More time, leadership from program officers	5.8%	2.7%	4.7%	8.7%	6.1%	4.6%	7.3%
Stronger emphasis on assessment by NSF	1.5%	2.7%	2.3%		2.4%		1.6%
Help from NSF with evaluations	3.9%	2.7%	2.3%	6.5%	5.0%	7.2%	
Too much turnover at NSF	5.7%	2.7%	4.7%	8.7%	8.7%	3.9%	5.8%
NSF should make more on-site visits	8.7%	5.4%	7.0%	13.0%	14.1%	5.9%	7.5%
More funding from NSF	15.3%	10.8%	16.3%	19.6%	20.3%	14.9%	10.7%
Provide follow-up funding for some projects	7.7%	5.4%	11.6%	6.5%	13.5%	6.3%	3.6%
NSF does not recognize unique aspects of Earth Science	.8%		2.3%	2.2%			
NSF has helpful program officers	5.2%	8.1%	2.3%	6.5%	2.4%	4.4%	7.0%
Received adequate support; no suggestions for improvement	12.1%	10.8%	16.3%	8.7%	9.7%	14.0%	12.6%

C06

Responses are weighted to represent all awardees

C05

40. Respond briefly to any of the following questions that you wish	All awards	Fiscal year of award					
		1984	1985	1986	1987	1988	1989
Responded	46.2%	43.5%	45.0%	48.1%	41.2%	49.1%	48.8%
Did not respond	53.8%	56.5%	55.0%	51.9%	58.8%	50.9%	51.2%
Do you have suggestions for NSF regarding ways to improve its operation of TEP?							
Respondents to this item	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
More lead time	14.1%	3.7%	11.1%	18.9%	19.0%	19.9%	10.7%
Simplify proposal procedures or guidelines	9.3%	7.4%	8.3%	10.8%	11.3%	11.5%	6.7%
NSF needs better peer and proposal reviewers	7.2%	18.5%	2.8%	8.1%	8.4%	4.7%	4.1%
Better criteria for PI who writes grant application	6.1%	7.4%	8.3%	8.1%	4.4%	6.5%	2.1%
More communication among PI's	14.9%	18.5%	19.4%	10.8%	10.7%	13.6%	15.8%
Newsletter for sharing information	7.4%	7.4%	5.6%	8.1%	3.4%	9.6%	9.2%
Allow release time during the project	.4%						2.1%
Simplify paperwork or organizational requirements	.9%			2.7%			2.2%
Suggestions on record keeping or grant administration	.9%	3.7%				2.4%	
Received generally inadequate support from NSF	1.0%				4.3%		2.4%
Better access to NSF support staff; unhelpful program office	12.4%	3.7%	8.3%	10.8%	14.8%	19.2%	15.5%
More time, leadership from program officers	5.2%	7.4%	5.6%	2.7%		5.4%	9.1%
Stronger emphasis on assessment by NSF	4.4%	3.7%	5.6%	2.7%	4.3%	2.8%	7.1%
Help from NSF with evaluations	5.8%		2.8%	5.4%	16.7%	5.0%	6.5%
Too much turnover at NSF	4.9%	3.7%	2.8%	8.1%		5.7%	7.0%
NSF should make more on-site visits	4.7%	7.4%	5.6%	2.7%	7.6%	6.7%	
More funding from NSF	14.5%	11.1%	19.4%	13.5%	19.3%	9.0%	15.4%
Provide follow-up funding for some projects	15.6%	14.8%	19.4%	16.2%	11.6%	19.0%	11.5%
NSF has helpful program officers	2.3%		2.8%	5.4%		2.4%	2.2%
Received adequate support; no suggestions for improvement	10.3%	7.4%	16.7%	10.8%	10.6%	4.8%	11.1%

Responses are weighted to represent all awardees

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